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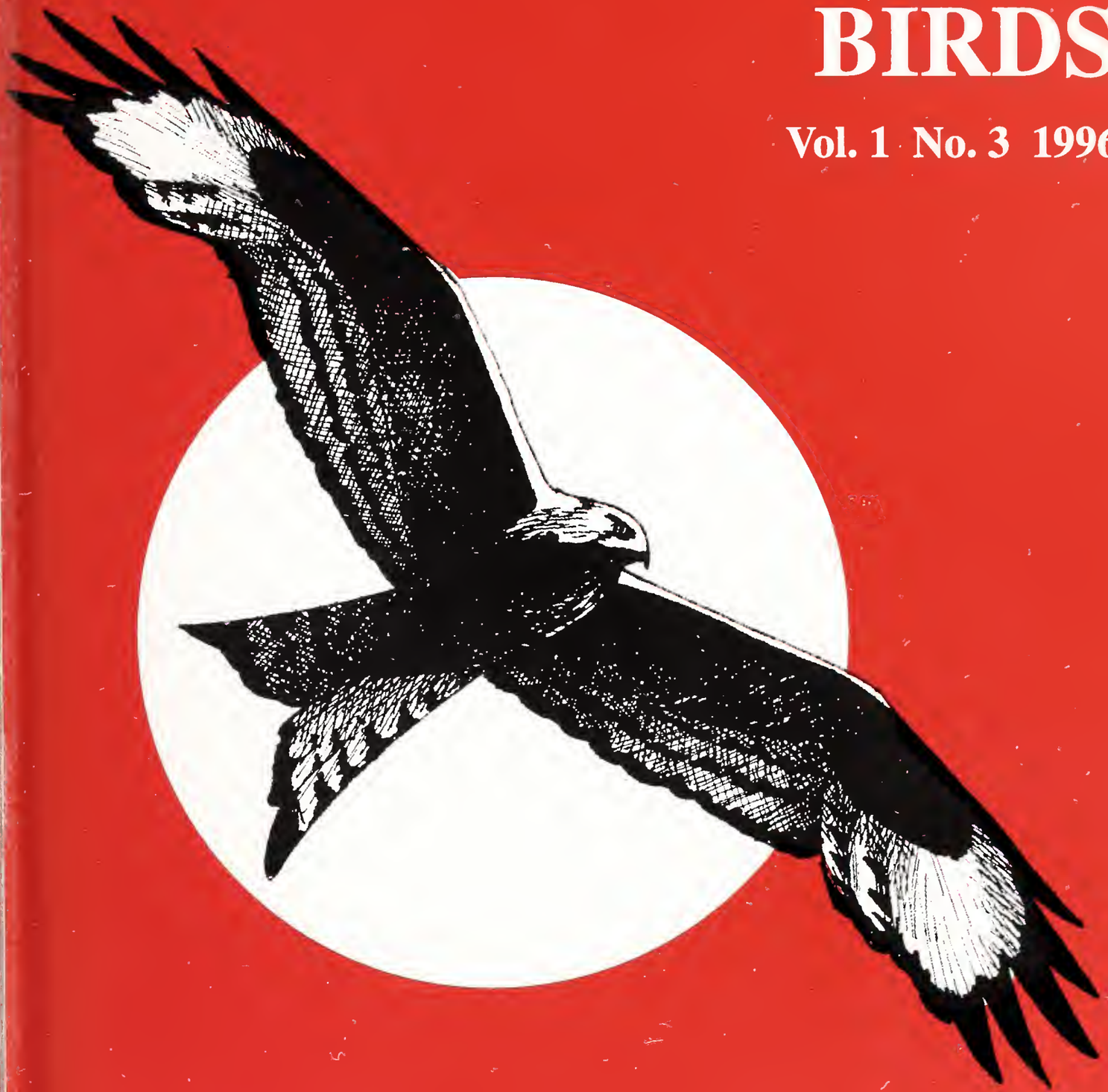
WELSH BIRDS

Vol. 1 No. 3 1996



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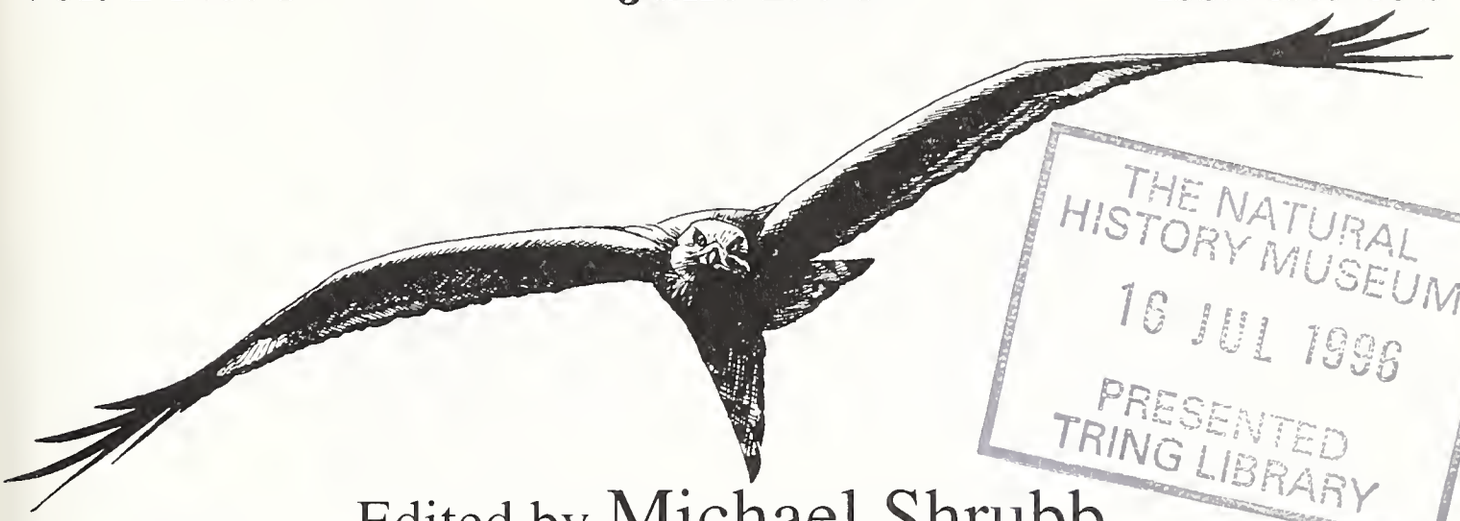

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INTRODUCTION & ACKNOWLEDGEMENTS

'Welsh Birds' is the journal of the Welsh Ornithological Society and is published twice annually, in June and December. The December issue is primarily devoted to the Welsh Bird Report and the annual Report on Bird Ringing in Wales.

Papers for Welsh Birds are welcomed by the Editor on any aspect of Welsh Ornithology. The Society is anxious that the journal should accurately reflect present ornithological activity in Wales. Thus we hope that all workers, professional or amateur, with results of bird studies in Wales, will always consider publishing information about these here. All papers will be reviewed by the Editor and an independent referee. Authors should follow the format of papers published in the journal and guidelines for authors have been drawn up and are available from the Editor (address inside front cover). Papers are accepted and published in either Welsh or English. Papers in Welsh should be supplied with captions to tables and figures in both Welsh and English and with an English summary. This follows standard international practice.

Short notes on interesting or unusual features of behaviour recorded in Wales are also welcome. An accumulation of such items is of considerable value. Notes should be short and succinct, ideally of not more than half a page in length. Notes may also be submitted in either Welsh or English.

This issue is numbered 3 of Volume 1. We have decided to let each volume comprise at least 4 issues, to make more satisfactory volumes for binding, if readers so desire.

ACKNOWLEDGEMENTS

Once again it is a pleasure to acknowledge the help of a number of people in putting this issue together. As always we are grateful to Bob Mitchell and Steve Roberts for further illustrations for the journal. Their unstinting support over the past 5 years has been of great assistance. We are also pleased to thank Colin Richards and Philip Snow for further illustrations and Tony Prater for considerable help with some of the figures. The Editor would also like to acknowledge the help of all those who have acted as Referees for papers. It is an important task, which should not go unnoticed.

SPONSORS

Once again we are very grateful for the continued support of our Sponsors, Chevron Oil UK Ltd. Their very welcome help has made an important contribution to the creation of this journal. Our sincere thanks.

COLONIES OF THE ROOK *Corvus frugilegus* IN NORTH CEREDIGION 1975-1994

A. O. CHATER, Windover, Penyrangor, Aberystwyth, Ceredigion SY23 1BJ

SUMMARY

A survey of rookeries from 1975 to 1994 in Ceredigion (vc 46) north of national grid line 70 showed an overall increase in nest numbers of about 30% up to the mid 1980s and a fluctuation at about this level thereafter, with a maximum of 2550 nests. There was no significant increase in rookery numbers, which fluctuated around 50. The density of nests varied from 3.0 to 4.2 per km^2. Rookeries were chiefly confined to woods in the lowland valleys, but were largely absent from the coastal strip, and site selection is indicated for the neighbourhood of occupied buildings and busy roads. Oak, Ash, Sycamore, Pine and Beech are, in decreasing order, the favoured trees for building in, and there was a move out of Pine and into Ash during the survey. Conifer plantations were virtually unused. Variation in stability of rookeries in different parts of the study area, as well as patterns of colonisation and desertion, are discussed. The Rook population was able to increase itself as successfully in areas where the rookeries were very unstable as in those where they were relatively stable. An analysis of agricultural changes in the study area showed a significant correlation between increase in stocking rates and increase in nest numbers. Tillage occupied not more than 2.9% of the area and changes in this had therefore insignificant effects.

INTRODUCTION

The area of North Ceredigion covered in this survey is approximately 30 km from north to south and 15-30 km from west to east, and comprises about a quarter of Ceredigion. Two earlier surveys of Rook (*Corvus frugilegus*) colonies in the study area have been published. Walton (1928) covered roughly the same area in 1913-1916; unfortunately the notes for his rather general account cannot be found. Chater *et al.* (1974) surveyed the whole of Ceredigion (then Cardiganshire) from 1959 to 1967. There was no attempt in that survey to make complete counts in any one year, so the numbers of rookeries and nests were to some extent estimates. Nevertheless, comparisons were attempted with Walton's survey, and evidence produced to suggest that the total number of nests in North Ceredigion had increased by 15-25%, that the number of rookeries had increased by 75-80%, and that the number of nests per rookery had gone down to only a quarter of what it was in 1913-1916.

The Chater survey continued in a desultory way until 1975.

Birkhead (1974) remarked: "Clearly the best method of monitoring Rook populations is to carry out detailed censuses each year. However, this is very time-consuming, and generally impractical." From 1975 until 1994 I carried out a more detailed survey, but restricted to North Ceredigion where I attempted annual counts of all the rookeries and recorded a wide range of parameters for each site. A preliminary report was published in 1992 (Chater 1992), and brief summaries have appeared almost annually in the *Ceredigion Bird Report*. Ceredigion data were contributed to the B.T.O.'s national rookery census in 1975 and to the sample survey in 1980.

METHODS

Study area

The area surveyed is that part of Ceredigion (or Cardiganshire, vc 46) north of national grid line 70 (Figures 1 & 3). It covers about 600 km^2, extending from the coast and Aberystwyth in the west to the uplands of Pumlumon (752 m) and Elenydd (572 m) in the east, and from the Dyfi estuary in the north to Llanrhystud and the Wyre valley in the south. The major valleys, containing most of the settlements, run east-west. Along most of the coast the land rises steeply to 100-150 m and the western lowland half of the area has the general appearance of a dissected plateau, except for the large area alongside the Dyfi estuary and the Cors Fochno raised mire which is more or less at sea level. Woodlands are chiefly confined to the sides of the valleys. The upland, eastern half of the area is chiefly

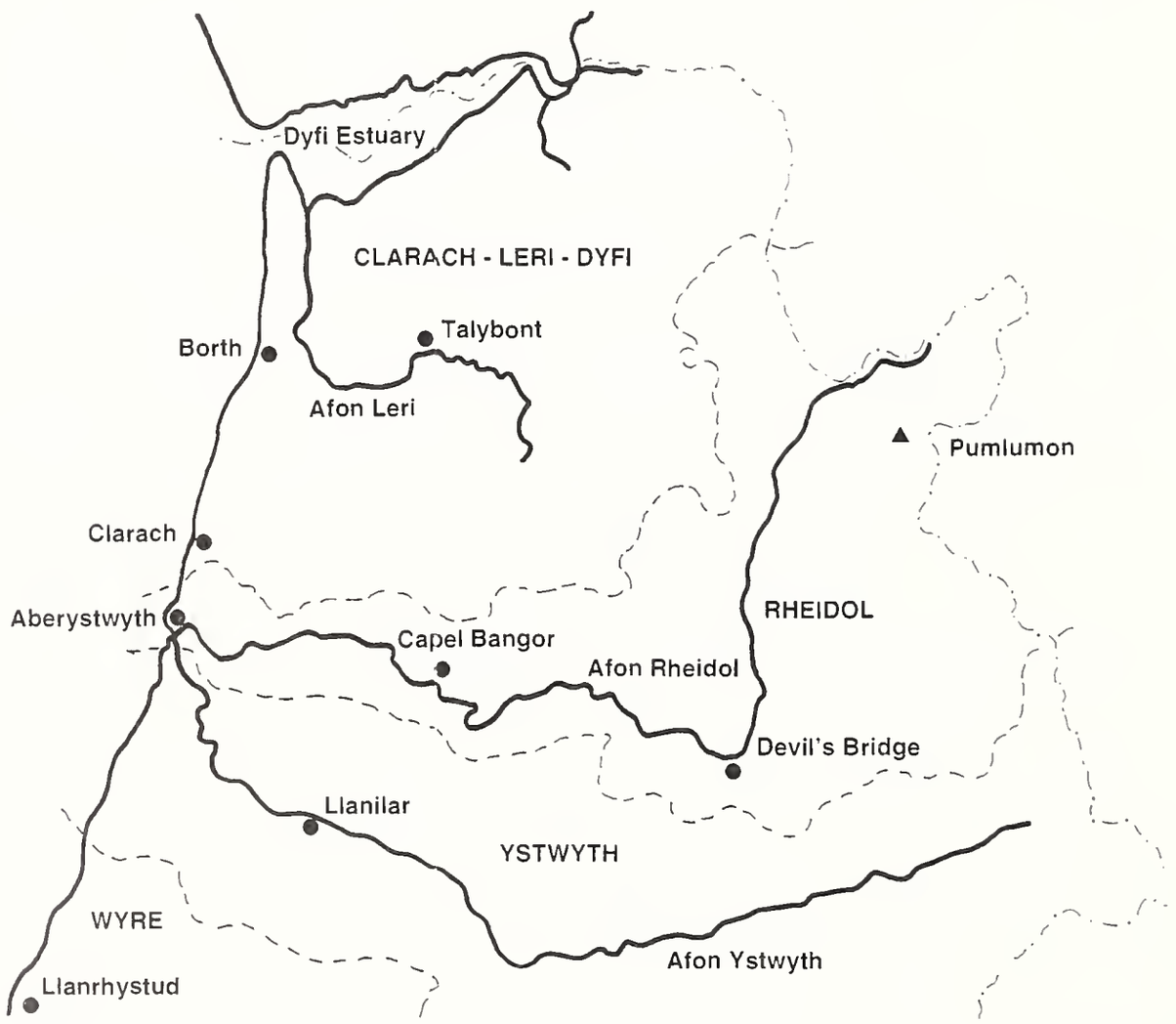

Figure 1. The study area of North Ceredigion, showing major settlements and rivers. River catchments are shown in capitals and separated by dashed lines. The dashed and dotted line is the county boundary.

sheepwalks and moorland with extensive conifer plantations. There are few settlements and the valleys tend to be well-wooded, again with many conifer plantations.

The underlying geology is Silurian and Ordovician shales and mudstones. The soils are chiefly brown earths, well-drained loamy soils in the lowlands, and brown podzolic soils and surface peat in the uplands (Rudeforth 1994), and are generally acidic. In the lowlands the agriculture is based on livestock rearing, chiefly cattle and sheep (with an increase in sheep in the winter). Arable farming is a very inconspicuous feature of the landscape. The uplands, where unforested, are largely given over to sheep, and the upland sheepwalks are a major feeding ground for Rooks out of the breeding season.

The climate is generally oceanic in character, with predominantly south-westerly and westerly winds. Northerly and easterly winds are often common in spring and early summer. The rainfall ranges from about 1000 mm on the coast to over 2500 mm on Pumlumon, with April, May and June generally the driest months and October and November the wettest. Temperatures tend to be lowest in February and highest in August, and the growing season at Aberystwyth extends from late February to mid-December.

Agricultural statistics were obtained from the Welsh Office in the form of parish summaries for June 1978 and June 1988, enabling the information summarised in Table 6 to be calculated for each of the 27 parishes within the study area. Because of problems of legibility of some of the returns for 1978, the figures quoted for that year must be regarded as only approximate. The areas of the parishes were taken from the 1902 O.S. six-inch maps, with appropriate conversion to their modern layout. All parishes wholly or partly within the study area were included, with the exception of Upper Gwnnws, only a small fraction of which extends north of national grid line 70.

Recording methods

All known rookeries were visited as late as possible but before the trees were so far into leaf that counting nests was difficult. Counting dates ranged from March 23 to April 29, and for practical purposes the counts were mostly done over the Easter weekend and usually took 4-5 days. Some rookeries were overlooked initially, especially new ones that had started in inconspicuous sites and with few nests. Wherever possible, approximate counts by local observers were used to fill such gaps; they are unlikely to distort the general picture. Throughout the survey, former rookery sites were checked each year to obviate any chance of observer error with regard to recolonisations.

All fully built nests in an occupied rookery were counted. This may have resulted in the counts including a proportion of unoccupied nests, but within the survey such errors will have been consistent. The number of nests in each individual tree was recorded, as well as the kind of tree.

Defining a rookery is extremely difficult. Methods range from Coombs (1961) who "regarded a divided rookery to be one unit if the 'nuptual' pursuit flights go round both parts and involve members of both parts", to Sage & Nau (1963) and the B.T.O.'s instruction sheet for the 1975 National Rookery Survey which says "any group of nests 100 metres or more from the next nearest group will be regarded as a separate rookery." Coombs's method is clearly impractical for a large survey. I used the B.T.O. rule for the first half of the present survey, although I had earlier used 200 m (Chater *et al.* 1974), but this resulted in so many changes from year to year, with rookeries repeatedly splitting and joining up, that I reverted to using 200 m as the critical distance. Even so, the creation or loss of rookeries by the desertion or building of sometimes just a single nest occasionally seemed very arbitrary. It is important to note that because of my strict application, sometimes in retrospect, of the 200 m rule, the census data in this paper differ from those given previously in Chater (1992) and in the *Ceredigion Bird Reports*. Backward extrapolation of nest numbers for previously overlooked rookeries has also resulted in small changes.

In addition to these annual counts, in 1984, 1990 and 1994 a record sheet was completed for each rookery, covering 67 parameters. The more relevant features included: (a) nest density within the rookery boundary; (b) the arrangement of the trees (isolated trees, size of wood, etc.); (c) the topography of the site; (d) land use for the area within 100 m of any part of the rookery and (e) also for the 1 km square centred on the rookery; and (f) the distance to various natural and man-made features.

Copies of the census, as well as the record sheets for each rookery compiled in 1984, 1990 and 1994, have been deposited in the Welsh Ornithological Society's archives at the National Museum of Wales and at the British Trust for Ornithology. I have retained the field notes containing, among other details, the information on kinds of tree used.

RESULTS

Numbers of rookeries and nests

Table 1 shows the number of rookeries and total nests, as well as the average number of nests per rookery. Figure 2 shows the trend in numbers of total nests. There was an overall increase in nest numbers of about 30% from 1975 to the mid 1980s, and for the second half of the survey numbers fluctuated at around this level. There were conspicuous falls in nest numbers in 1980-1983, in 1989 and in 1994. Despite the significant increase in numbers of nests, the numbers of rookeries per year showed no significant trend over time

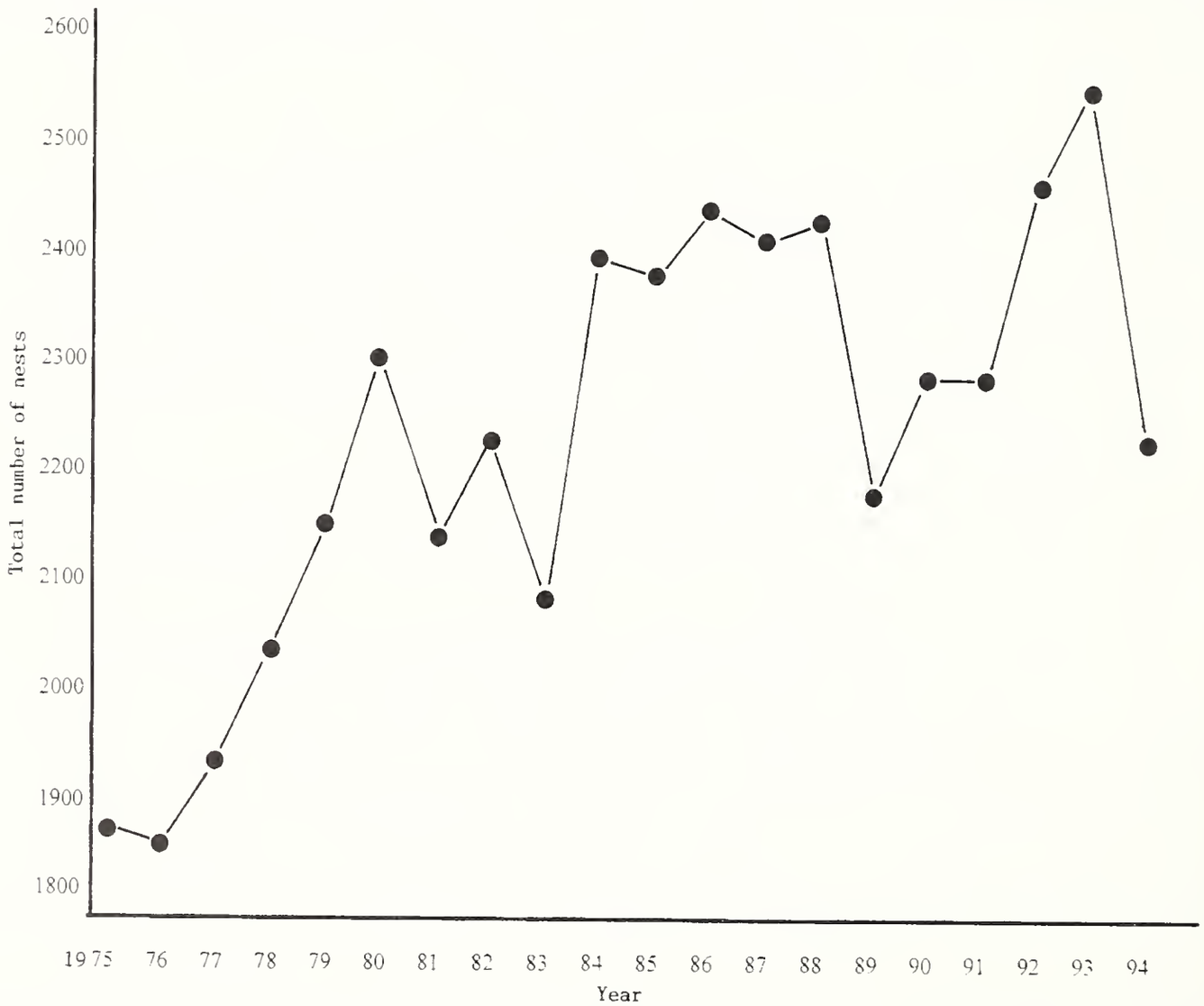

Figure 2. Total number of rooks' nests in North Ceredigion in each year from 1975-1994. The overall trend was statistically significant ($r_s = 0.73$, $n = 20$, $p < 0.01$) but see text.

Table 1. Total numbers of rookeries and nests in North Ceredigion and the average number of nests per rookery, in each year of survey.

Year	*Number of rookeries*	*Number of nests*	*Average nests per rookery*	*Year*	*Number of rookeries*	*Number of nests*	*Average nests per rookery*
1975	46	1875	41	**1985**	47	2374	51
1976	43	1862	43	**1986**	51	2446	48
1977	47	1941	41	**1987**	53	2413	46
1978	50	2038	41	**1988**	49	2431	50
1979	56	2159	38	**1989**	51	2183	43
1980	53	2308	44	**1990**	45	2293	51
1981	51	2149	42	**1991**	49	2289	47
1982	49	2232	46	**1992**	50	2466	49
1983	49	2085	43	**1993**	48	2550	53
1984	46	2401	52	**1994**	54	2233	41

(r_S = 0.20, n = 20, ns) and fluctuated around 50. Rookeries ranged from 43 in 1976 to 61 in 1979, and total nests from 1862 in 1976 to 2550 in 1993. Average number of nests per rookery ranged from 38 in 1979 to 53 in 1993, with a mean of 45.5, and showed a significant increase over time (r_S = 0.57, n = 20, P<0.01) with a rise of about 25% over the survey period.

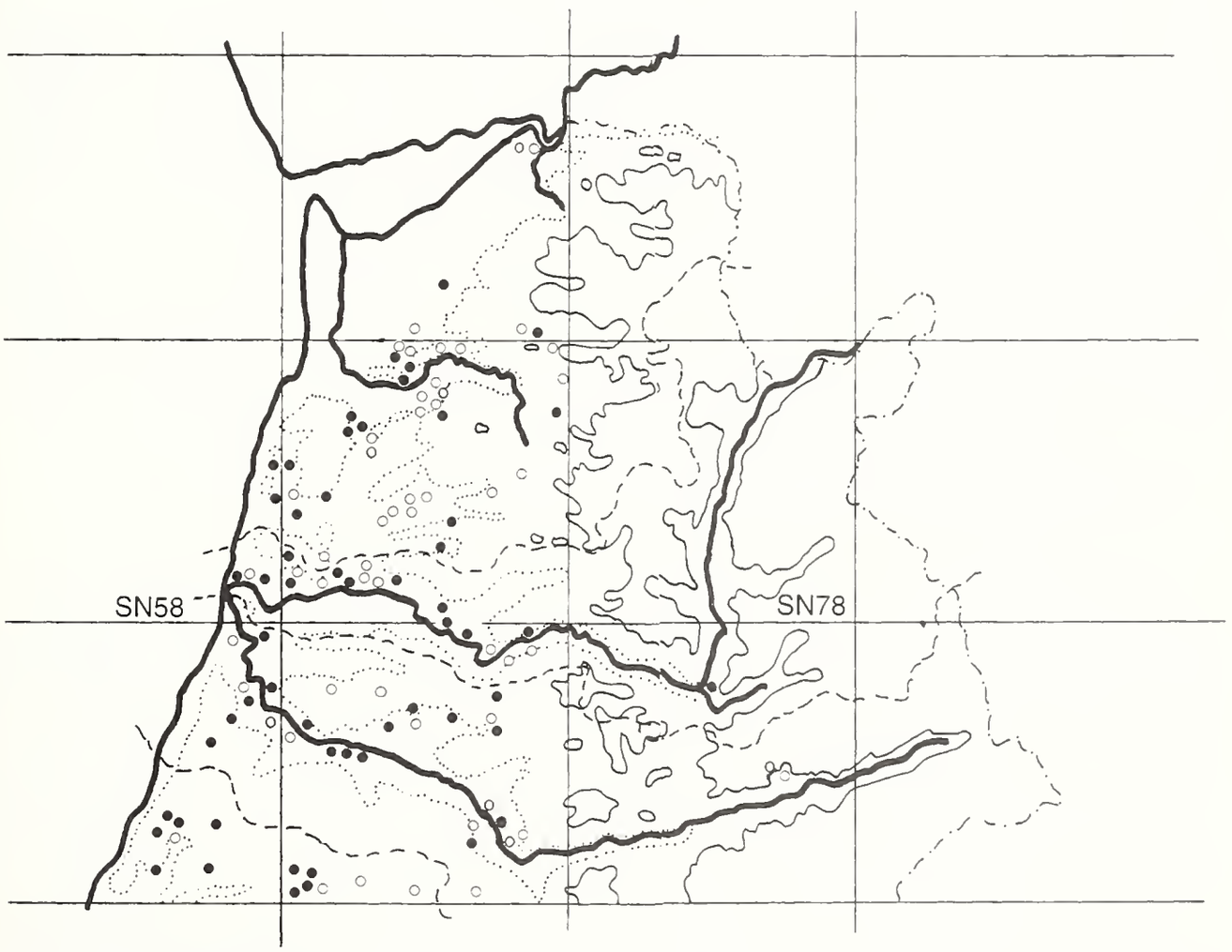

Figure 3. The distribution of rookeries in North Ceredigion, with 10-km national grid, major rivers and catchments (see Figure 1) and the 100 m contour (dotted lines) and 300 m contour (thin solid lines). Rookeries occupied in 1994 are shown as filled circles, those occupied at some time during 1975-1993 but not 1994 are shown as open circles.

Table 2. Geographical features of rookery sites in North Ceredigion in 1984 and 1994. Significance values (ns = not significant) are from contingency table analysis comparing the proportions of colonies and nests recorded under each category in each year (see text).

	1984			*1994*		
Features	*Number of colonies*	*(%)*	*Number of nests*	*Number of colonies*	*(%)*	*Number of nests*
Height				**ns**		**P<0.01**
0-50 m asl	23	(50)	1223	23	(42)	929
51-100 m asl	14	(30)	577	15	(28)	581
over 100 m asl	9	(20)	601	16	(30)	723
Slope				**ns**		**P<0.001**
level ground	20	(44)	1031	20	(37)	630
slight slope	14	(30)	936	24	(44)	1298
steep slope	12	(26)	434	10	(19)	305
Valley/plateaux				**ns**		**P<0.01**
major valley	25	(54)	1308	26	(48)	1055
minor valley	19	(42)	1034	22	(41)	1051
plateau	2	(4)	59	6	(11)	127
Shelter				**ns**		**P<0.01**
sheltered site	27	(58)	1273	30	(55)	1265
moderately exposed	18	(40)	1095	22	(41)	963
very exposed	1	(2)	33	2	(4)	5
Site type				**ns**		**ns**
isolated tree	1	(2)	2	2	(4)	22
group/row trees	13	(28)	382	19	(35)	366
copse*	4	(9)	174	3	(6)	127
wood**	28	(60)	1843	30	(55)	1718

Note: * defined as less than 50 x 50 m in area; ** defined as more than 50 x 50 m in area.

Rookery distribution

Figure 3 shows the location of all rookery sites found during the survey. They were concentrated in the lowland, western half of the area, where they had an uneven distribution. The 54 sites occupied in 1994 are shown as distinct from those not occupied then, to indicate how the pattern in one year relates to the overall distribution. Table 2 shows the distribution of rookeries in 1984 and 1994 relative to several major geographical features, with some simplification. Where, for example a rookery was on both level ground and a slope, only the dominant feature is used for the table. The altitude was taken as the ground level at the middle of each rookery.

Contingency table analysis for Table 2 showed that the proportions of rookeries in each category did not vary between the two years. As rookeries were very mobile within the study area (see below) this suggests a strong element of selection for rookery sites within each category. Except in site type, where numbers were constant, however, similar analysis of the number of nests showed considerable variation. This almost certainly reflects the instability of the rookeries. Sites were favoured for constant reasons, but numbers at these

sites varied and must be largely governed by other factors.

Over 50% of the rookeries were in major valleys, with most of the remainder in minor valleys, and only a very small percentage was on the plateaux at about 100-150 m a.s.l., even though these plateaux are such a feature of the landscape. The rookeries on the plateaux were also half the size on average. The very largest rookeries tended to be in the major valleys, but the average size tended to be larger in the minor valleys. More rookeries were on level ground and slight slopes than on steep slopes, and this is the more striking as so many of the valley sides in the area are steep and the majority of woods are on steep slopes. Rookeries on slight slopes were on average much larger than those on level ground or steep slopes. There seemed no preference for any particular aspect of slope.

In both years over 50% of rookeries were in woods (defined as greater than 50 x 50 m in size), and this is also where the biggest rookeries were. Only about 10% were in copses (less than 50 x 50 m) while about 30% were in smaller groups or rows of trees; an insignificant number were in isolated trees. The apparent preference for small groups or rows of trees over copses is surprising, but may be explained by the sparsity of such copses in the area. Some 60% of rookeries were in apparently sheltered sites, 35-40% were in moderately exposed sites, and very few were in very exposed sites.

There was a steady decrease in numbers of rookeries with altitude, about two-thirds being below 100 m, and the highest was at 220 m at Devil's Bridge, SN 745772. In 1994 only 3 rookeries were within 1 km of the sea (the nearest, 350 m away, being in Alexandra Road, Aberystwyth, SN 585816). Although this is partly explained by the small amount of suitable low ground and woodland along the coast, even in the apparently appropriate valleys at Tan-y-bwlch, Aberystwyth, Clarach, Wallog and Borth there was a largely rookery-free zone along the coast, and none of the few rookeries there faced the sea or was at all coastal in character, perhaps reflecting the need for shelter from onshore gales. On the other hand, 50% of the rookeries were within 4 km of the sea (see Figure 3); this is probably explained by their frequency in the lower, but not coastal, parts of the major east-west valleys, and in the valleys (such as those of the Afon Carrog, Nant Llolwyn, Afon Clarach and the dry valleys at Fronfraith and Llandre) that run north-south parallel to the coast between 1 and 4 km inland.

Table 3. The proximity of rookeries in North Ceredigion to selected man-made and natural features in 1984 (46 rookeries) and 1994 (54 rookeries).

	Number (&%) of rookeries within each class		
Distance class in metres	*Occupied house farm or smallholding*	*Road lane or drive*	*River or stream*
1984			
0-100	39(85)	41(91)	31(68)
101-200	5(11)	4(9)	8 (17)
201-300	2(4)	0	2(4)
over 300	0	0	5(11)
1994			
0-100	43(80)	43(79)	35(65)
101-200	5(9)	7(13)	11(21)
201-300	4(7)	2(4)	4(7)
over 300	2(4)	2(4)	4(7)

Rookeries in relation to natural and man-made features

Table 3 shows the proximity of rookeries to a small selection of features measured in two years of detailed survey, 1984 and 1994. Although the distribution of these features in the study area is generally unquantified the universal proximity of rookeries to occupied

buildings is clearly significant. In 1984 all rookeries were within 300 m of an occupied building, 96% were within 200 m, 86% were within 100 m, and 75% were within 50 m. In 1994 all were within 400 m, and the other figures were 89% within 200 m, 80% within 100 m, and 63% within 50 m. Two-thirds of them were within 300 m of working farms or smallholdings.

In 1984 all rookeries were within 200 m of a road, lane or drive (and within 400 m in 1994), and 91% (94% in 1994) were within 100 m; 60% (42% in 1994) were within 200 m of an A or B road, and 41% (28% in 1994) were within 100 m. There are 156 km of A and B roads in the study area, so the area within 200 m of them occupies 62.4 km^2. This is 10.2% of the study area, yet it contained 60% of the rookeries in 1984 and 42% in 1994. Although the relationship between A and B roads and features such as woods, or occupied houses, is not known, it does seem that Rooks choose the neighbourhood of busy roads for their rookeries. By contrast, there are 106 km of rivers more than 5 m wide in the study area, and the area within 200 m of them occupies 42.4 km^2. This is 6.9% of the study area, and contained only 24% of the rookeries in 1984 and 12% in 1994. My impression, which I cannot substantiate, is that this is not explained by the relative abundance of trees alongside roads and rivers. The preference for major river valleys as sites for rookeries is, however, clearly not connected with any preference for riverbanks, and most woods in these valleys are on the flanks rather than in the valley bottoms.

Contingency table analysis for Table 3 shows that the patterns are the same for both 1984 and 1994. In view of the considerable mobility of the rookeries, discussed below, this argues strongly in favour of the sort of site selection postulated above.

Density of nests and aggregation of rookeries in the area

Although rookeries were generally confined to the lowlands, the uplands are an important feeding area outside the breeding season. The whole study area of c.600 km^2 can therefore be considered as used by the Rook population. The density of nests per km^2 varied from 3.0 in 1976 to 4.2 in 1993. In the 1975 census (Sage & Vernon 1978) densities in Wales varied from 5.2 in Pembrokeshire to 0.3 in Merioneth, and was 3.3 in Ceredigion. The average for Britain as a whole was also 3.3.

Figure 3 shows clearly the uneven distribution, both of rookeries in a single year, and of all the sites occupied by rookeries at some time within the study period. The distances from each rookery to its 5 nearest neighbours were measured in 1984, 1990 and 1994, so a measure of aggregation could perhaps be worked out for each year but this is not attempted here. In 1984, the average distance between a rookery and its nearest neighbour was 861 m (or 698 m if the 2 more than 2 km from their nearest neighbours are excluded). Aggregation may presumably be caused by the presence of several suitable sites in a small area, by the budding off of new rookeries, by the splitting up of existing rookeries as a result of habitat changes, or perhaps by the unsuitability of the area for just one or a few large rookeries.

Choice of trees for nest building

Within the study area, Rooks nested in 33 different kinds of tree (Table 4). Most nests were built in deciduous trees (69-81% each year, with 19-31% in evergreens. Oaks were the most popular tree each year, varying from 46.1% to 36.9% (no attempt was made to separate the species, which often hybridise in the area and cannot usually be identified until the leaves are out). The next most popular deciduous trees were Ash (22.5% to 9.1%), Beech (9.9% to 5.1%), Sycamore (7.4% to 4.2%), Elm (5.9% to 0.4%) and Alder (3.5% to 0%). None of the remaining broadleaved kinds ever held more than 2% of the nests.

Among evergreens, Pines comprised the great majority (28.4% to 14.5%); the species involved were not distinguished until after 1981, when there were roughly equal percentages of Scots Pine (*Pinus sylvestris*) and Corsican/Austrian Pine (*P. nigra*). During the last 4

Table 4. The kinds of trees in which nests were built in rookeries in North Ceredigion, with the percentage in each kind over the survey. Trees are listed in order of frequency.

Tree species	*% of nests during the survey*
Oak (*Quercus* spp.)	36.9 - 46.1
Ash (*Fraxinus excelsior*)	9.1 - 22.5
Beech (*Fagus sylvatica*)	5.1 - 9.9
Sycamore (*Acer pseudoplatanus*)	4.2 - 7.4
Elm (*Ulmus* spp.)	0.4 - 5.9
Alder (*Alnus glutinosa*)	0 - 3.5
Field Maple (*Acer campestre*)	0 - 1.2
Lime (*Tilia x vulgaris*)	0 - 1.1
Larch (*Larix* spp)	0 - 0.8
Horse Chestnut (*Aesculus hippocastanum*)	0.1 - 0.7
Birch (*Betula* spp.)	0 - 0.5
Broad-leaved Whitebeam (*Sorbus latifolia*)	0 - 0.5
Poplar (*Populus* spp.)	0 - 0.4
Orange-fruited Whitebeam (*S. croceocarpa*)	0 - 0.3
Sweet Chestnut (*Castanea sativa*)	0 - 0.1
Walnut (*Juglans regia*)	0 - 0.1
Wild Cherry (*Prunus avium*)	0 - 0.1
Rowan (*Sorbus aucuparia*)	0 - 0.1
Grey Willow (*Salix cinerea*)	0 - 0.1
Total deciduous trees	**68.9 - 81.7**
Pine (*Pinus* spp., not separated until 1982)	14.5 - 30.1
Scots Pine (*P. sylvestris*)	5.9 - 14.2
Corsican/Austrian Pine (*P. nigra*)	7.2 - 12.2
Monterey Pine (*P. radiata*)	0 - 0.6
Fir (not separated until 1981)	1.2 - 3.4
Silver Fir (*Abies alba*)	0.3 - 2.2
Douglas Fir (*Pseudotsuga menziesii*)	0.7 - 1.9
Sitka Spruce (*Picea sitchensis*)	0 - 2.5
Holly (*Ilex* spp.)	0 - 0.8
Evergreen Oak (*Quercus ilex*)	0 - 0.6
Norway Spruce (*Picea abies*)	0 - 0.5
Lawson's Cypress (*Chamaecyparis lawsoniana*)	0 - 0.3
Deodar (*Cedrus deodara*)	0 - 0.2
Cherry Laurel (*Prunus laurocerasus*)	0 - 0.1
Japanese Red-cedar (*Cryptomeria japonica*)	0 - 0.1
Western Red-cedar (*Thuya plicata*)	0 - 0.1
Total evergreen trees	**18.3 - 31.1**

years of the survey, however, there were about twice as many nests in Corsican/Austrian Pines as in Scots Pines.

Figure 4 shows changes during the course of the survey in the percentages of the most favoured trees used. The most obvious trend is the move out of Pine and into Ash. The statistically significant increase in the use of trees other than Oak, Ash and Pine depends on a small percentage in other evergreens used becoming less small ($r_S = 0.54$, n = 20, $P<0.01$). There is no significant trend in the use of other deciduous trees ($r_S = 0.08$, n = 20.ns).

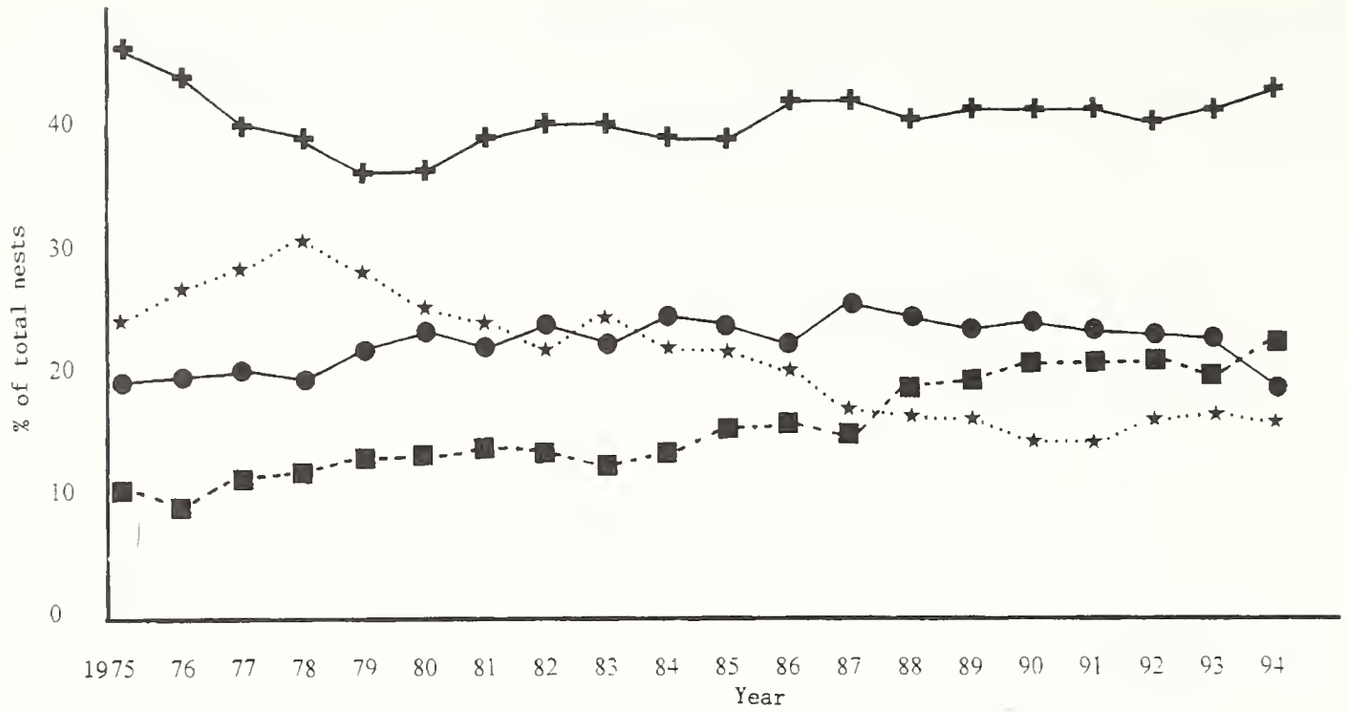

Figure 4. Percentages of rooks' nests in selected kinds of trees in North Ceredigion from 1975-1994. No significant trend was found in oak but there was a significant increase in Ash (r_S = 0.96, n = 20, P <0.01) and a significant decline in Pine (r_S = -0.92, n = 20, P <0.01).
Key: ✚ oak; ■ ash; ★ pine; ● other trees.

Life-span of rookeries

Here rookeries rather than sites are considered, and reoccupations of previously deserted sites are treated as new rookeries. Table 5 provides figures for the life-span of rookeries and for the maximum numbers of nests attained in each category, so far as this

Table 5. Characteristics of rookeries in North Ceredigion during 1975-1994. Records are broken down into river catchments (see Figure 1). Reoccupations of previously deserted sites are treated as new rookeries.

	Number (&%) of sites by river catchment				
	Wyre	*Ystwyth*	*Rheidol*	*Clarach-Leri-Dyfi*	*Total*
Total rookeries	**17**	**31**	**25**	**51**	**124**
Rookeries existing in 1975 and 1994 (stable sites)	2(12)	8(26)	6(24)	2(4)	18(15)
Average max. of nests in above sites	105	137	75	130	112
Rookeries started in 1976 or later and still extant in 1994	8(47)	8(26)	6(24)	14(27)	36(29)
Average max. of nests in above sites	34	53	28	47	42
Rookeries existing in 1975 and deserted by 1994	4(24)	6(19)	7(28)	11(22)	28(23)
Average max. of nests in above sites	11	44	38	47	39
Rookeries started and deserted during 1975-1994 (ephemeral sites)	3(18)	9(29)	6(24)	24(47)	42(34)
Average max. of nests in above sites	24	14	15	9	12
Total rookeries started	11(65)	17(55)	12(48)	38(75)	78(63)
Total rookeries deserted	7(41)	15(48)	13(52)	35(69)	70(57)
Total sites used	14	30	21	43	108

could be assessed within the time-span of the study. It also provides a breakdown of the data between the 4 different parts of the study area based on the major river catchments (Figure 1). Of the 124 rookeries involved, only 18 (14.5%) existed throughout all 20 years of the survey (stable rookeries). Their average maximum size during the study period was 112 nests. Another 42 rookeries were both started and deserted within the survey period (ephemeral rookeries); these averaged only 12 nests. The remaining 64 rookeries were either in existence when the survey began and were deserted during it, or were started during the survey and were still in existence when it ended; their total life-span and ultimate maximum number of nests are therefore unknown.

The general instability of rookeries in the study area is well illustrated by Figure 5, showing the total numbers of nests in each tetrad (2 x 2 km square) at approximately 5-year intervals in the 10 km square SN 68 that covers part of both the Rheidol and Clarach - Leri - Dyfi catchments. The instability, especially in the north-east part of the square, is readily apparent.

The stability of rookeries varied between river catchments. Contingency table analysis showed that the proportion of ephemeral rookeries in Clarach - Leri - Dyfi was significantly higher than expected and the proportion of stable rookeries significantly lower, but that the differences between the other catchments were not significant Chi ⅞ = 12.90, $P<0.05$). Only 4% of all the rookeries in the Clarach - Leri - Dyfi catchment lasted throughout the study period, as against 12-26% in the other three catchments. The whole northern part of the

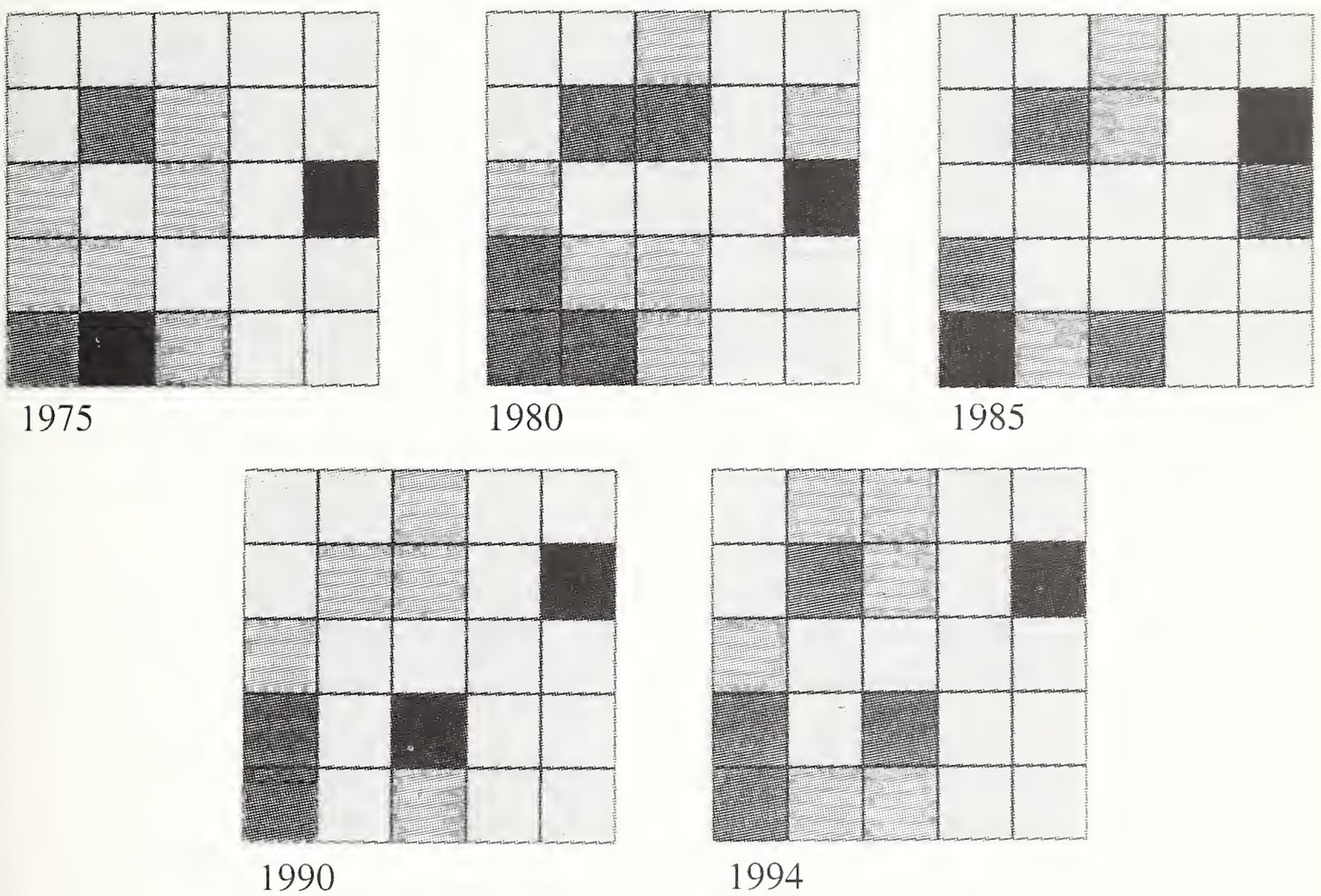

Figure 5. The number of nests per tetrad in 10-Km square SN68 (see Figure 2) at 5 year intervals during the survey.
Key: nil; <50; 50-100; >100.

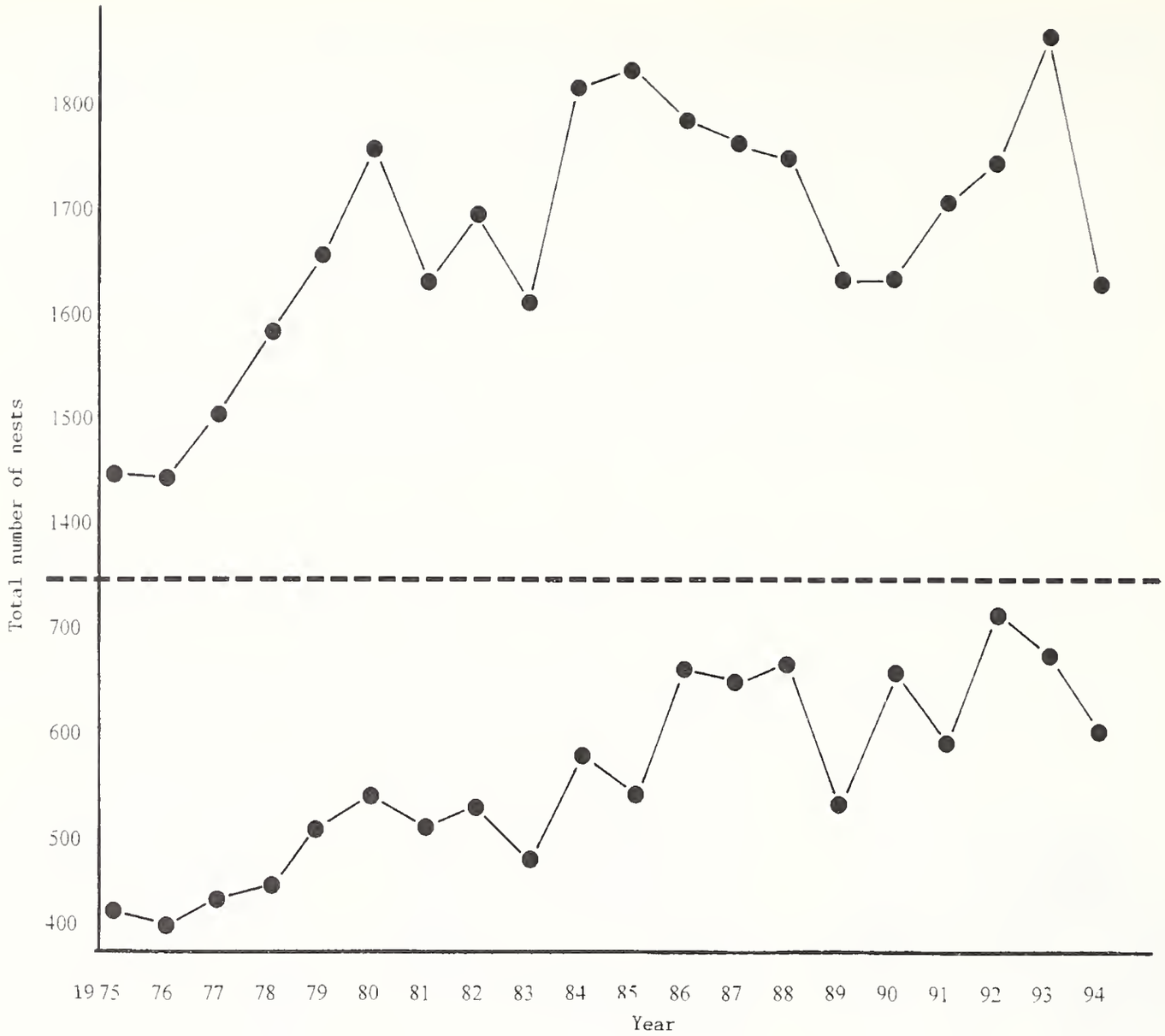

Figure 6. The total number of Rooks' nests in each year from 1975-1994 in Wyre, Ystwyth and Rheidol catchments combined (top) and the Clarach - Leri - Dyfi catchment (bottom). The overall trends in both were significant: Wyre, Ystwyth, Rheidol $r_S = 0.48$, n = 20, $P < 0.05$; Clarach - Leri - Dyfi $r_S = 0.89$, n = 20, $P < 0.01$. See text for other trends.

study area seemed inimical to the survival of individual rookeries. North of national grid line 86 no rookeries lasted the 20 years of the study, and north of grid line 91 (that is the Taliesin - Tre'r-ddôl - Ynys-hir area) none lasted more than a single year. The 16 rookeries around Tal-y-bont were almost all very unstable and short lived. This northern part of the study area cannot have been entirely unsuitable, as plenty of colonisations were made, but the rookeries did not last long and usually failed to enlarge.

Within ephemeral rookeries the maximum size attained was similar in all the river catchments, as was their life-span (one-way ANOVA: size $F_{3,38} = 0.82$, ns; life-span $F_{3,38} = 0.17$, ns). Furthermore there was a significant correlation between the maximum size attained and the life-span of ephemeral rookeries both in Clarach - Leri - Dyfi ($r_S = 0.42$, n = 24, $P < 0.05$) and Wyre + Ystwyth + Rheidol (lumped because of small samples) $r_S = 0.66$, n = 18, $P < 0.01$). Thus ephemeral rookeries behaved similarly everywhere, the Clarach - Leri - Dyfi catchment differing only in having more. Small rookeries were also shorter-lived, confirming Yapp's (1951) comment that small rookeries are in general more unstable than large ones.

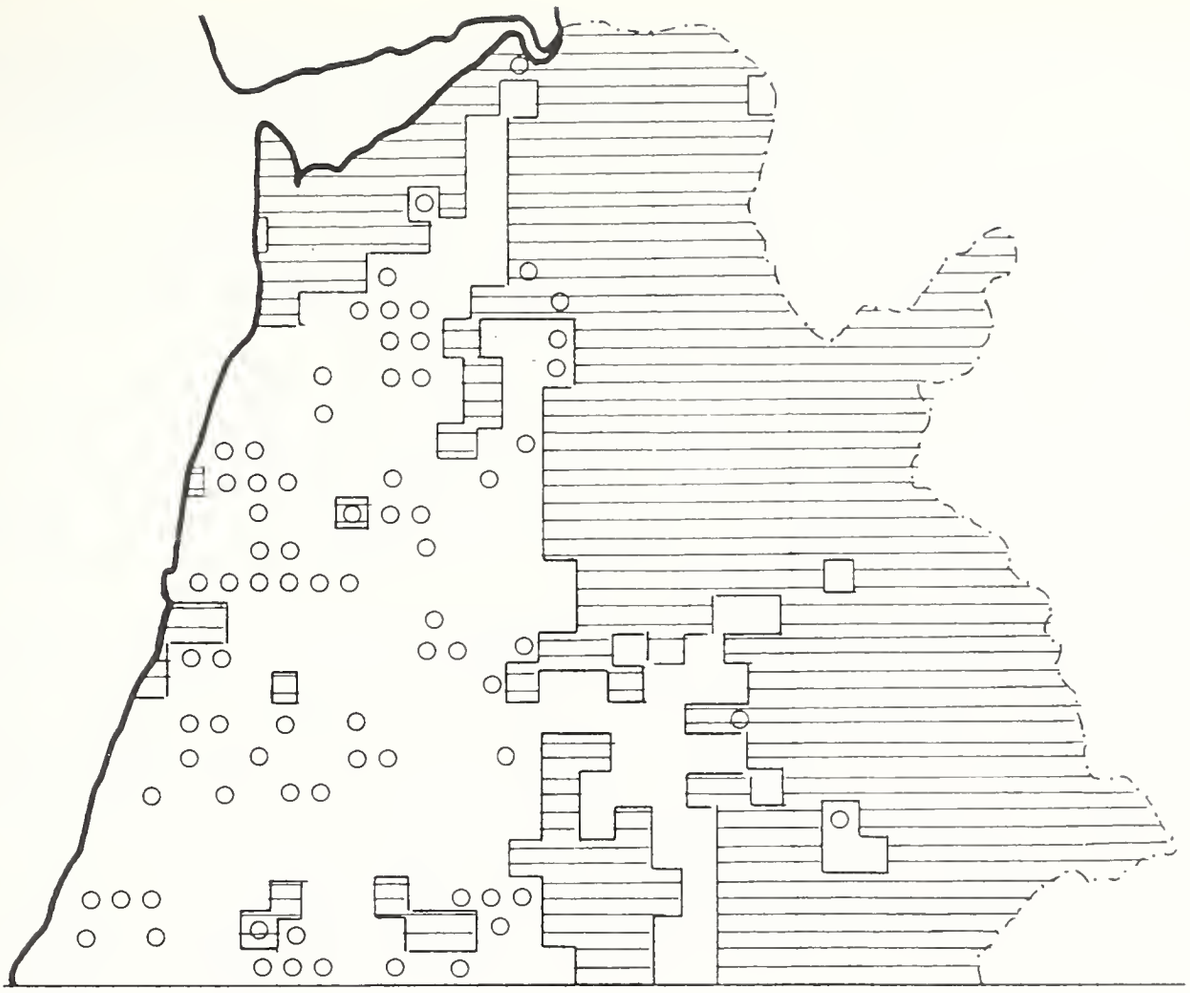

Figure 7. Distribution of rookeries in North Ceredigion by 1-km square (open circles) at any time during 1975-1994 compared to enclosed grassland (uninfested with bracken, rush, gorse) as a dominant land use in each 1-km square in 1961-66. Adapted from J. A. Taylor (in Carter, H. (ed) 1989; map 5.1a). The shaded area is unenclosed grassland.

Figure 6 compares the trend in nest numbers between the Clarach - Leri - Dyfi catchment and the other three catchments combined. There was a significant correlation. This is perhaps surprising in view of the pronounced differences in stability of the rookeries. The Clarach - Leri - Dyfi catchment held c. 25% of the total nests in the study area, and this percentage never varied by more than 3-4% in any of the 20 years of the survey. Perhaps the northern part of the study area is a "sink" which absorbs surplus birds from the south when numbers are high, and loses them when numbers further south fall; but there is an underlying tendency for numbers of nests to increase in this catchment which may be related to changes in agriculture (see below).

Figure 7 shows that the enclosed grassland clearly favoured for rookeries tapers out in the northern part of the study area, constricted between the uplands on the east and the raised mire of Cors Fochno, the Dyfi estuary and the sea on the west. This may partly explain why rookeries behave so differently here. The Dyfi valley varies from 12 to 4 km wide and so is much less of a steep-sided valley environment than those of the Rheidol and Ystwyth, but the Leri valley would seem ideal for stable rookeries. There is a widespread human perception that the North Wales landscape, more rugged and "upland" in character, starts just north of Tal-y-bont at about grid line 90 (where one passes from the Leri valley into the main Dyfi valley), so there may well be a combination of environmental factors changing about here that affects rookeries as well. Rookeries are very sparse north of the Dyfi in Merioneth (Lovegrove *et al.* 1994). Persecution and destruction of sites certainly

provides no explanation of the differences. Only two rookery sites were completely abandoned during the survey following destruction of trees used for nesting (both in the Clarach - Leri - Dyfi catchment), and surprisingly no previously occupied sites were destroyed during the survey. In all other cases where trees with nests were felled, the rooks built in nearby trees the following year.

Table 5 also shows the turnover rate of the rookeries in each catchment giving the numbers of both initiations and desertions. Turnover was high in Clarach - Leri - Dyfi catchment (143%), compared to the other three (100-106%).

During the life-span of a rookery there is usually a gradual increase of nest numbers after initiation, and a gradual decrease before desertion; in between, the numbers may fluctuate considerably. Of the 78 rookeries that were initiated during the survey, 72% started with not more than 10 nests and 5% with only single nests. The largest initiation, of 52 nests, appeared at Troedrhiw-ceir, SN 679785, in 1977; the following year there were 32 nests and the next year it was deserted.

Of the 70 rookeries that were deserted during the survey, 76% ended with not more than 10 nests, and the overall patterns of size of rookeries in their first and last years were very similar. The two largest rookeries in their final year held 46 (Cefn-coch, SN 612703, in 1989) and 47 (Nantcellan, SN 599844, in 1976) nests. At the latter site, 8 nests appeared again in 1980, none in 1981-85, and then 14 in 1986 and the rookery continued to the end of the survey).

During the survey, 15 sites were reoccupied after a gap of a year or more. Of these reoccupations, 6 took place after one year's gap, 2 after 2 years, one after 3 years, one after 4 years, 2 after 5 years, 2 after 6 years, and one after 13 years. In most cases there were remains of nests present from the previous rookery, which may perhaps have drawn Rooks back to the site, and it may perhaps have been Rooks from the previous rookery that returned. Although most nests in abandoned rookeries had deteriorated markedly or been destroyed by wind or by Rooks collecting sticks, within a year or two of desertion, some lasted 5-8 years. In the case of reoccupation after 13 years the new nests were in Pines at Llandre churchyard, SN 623870, 100 m from the previous nests in Beeches at the edge of a wood. At Cwm-mwythig, SN 639811, a small isolated Oak and Beech wood in a stream dingle, a rookery of 38 nests in 1985 declined and was deserted in 1988; all the nests had disappeared by 1991. In 1994 Rooks returned and built 20 nests, after a gap of 6 years. The next nearest rookery in 1994 was 1.8 km away at Broncastell, Capel Bangor, SN 655803, which had coincidentally dropped from 54 nests in 1993 to 11 in 1994. It is tempting in such cases to draw conclusions about the origins of the colonising Rooks, but one would need to take into account the pattern of changes in a much wider area before suggesting this, and in the absence of ringing or marking of birds such as is described in the study of fluctuations in Rook colony size by Richardson *et al.* (1979) any conclusions would be speculative.

Agriculture

The study area has a very uniform agriculture based on pastoral enterprises and in 1988 agricultural land comprised c. 82% of the total (Table 6). In Ceredigion as a whole in 1980 broadleaved woodland occupied 2.3% of land and conifer plantation about 7.2% (Chater 1994). The study area has rather more tree cover than this overall 9.5%, leaving some 8% or less under built-up areas, moorland, bog etc.

Table 6 summarises the agricultural statistics from the 27 parishes in the study area for 1978 and 1988. The main changes were declines in rough grazings and in the small area of tillage crops, and changes in stocking patterns, as sheep superseded cattle. Grouping of these parish statistics into the river catchments used already here shows that these changes are broadly uniform throughout the area. The main differences between catchments were that sheep became relatively more important in Ystwyth and in Clarach - Leri - Dyfi, and that

Table 6. The basic composition of farmland and numbers of stock in North Ceredigion in 1978 and 1988. Data from the Parish returns of the MAFF June Census. Figures for nest density are also given.

	1978		*1988*		
	Area (ha)	*% study area*	*Area (ha)*	*% study area*	*% change*
Rough grazing	c.21362	36	16891	28	-21%
Improved grass	c.26456	44	31890	53	+20%
Tillage	c.1724	3	638	1	-63%
Cattle	c.27754		25725		-7%
Sheep	c.321293		388643		+21%
Stocking rates	1.32		1.40		+6%
Rooks' nests per 100 ha farmland	3.37		4.02		+19%

Note: Stocking rates are calculated as livestock units (sheep x 0.11 + cattle) per ha of all grass.

stocking rates rose faster in Wyre (+20%) and Clarach - Leri - Dyfi (+9%) than in Ystwyth (+4%) or Rheidol (+1%).

A major relationship between breeding Rooks and land-use in the study area is shown by Figure 7. Rooks predominantly breed in enclosed farmland, avoiding open hill and common grazings, although these areas are often important feeding grounds after breeding.

During the study period there was also a tendency for nest numbers to increase in the Wyre and Clarach - Leri - Dyfi catchments (although colonies were unstable in the latter) and to decline in Ystwyth and Rheidol (Table 7). The changes illustrated in the Table appear to follow the changes in the stocking rates noted in these catchments. The idea that stocking rates may influence Rook numbers was tested further by comparing densities of nests in occupied parishes with stocking rates. To do this a map of parish boundaries was laid over a map of nest numbers per occupied tetrad for 1988, when the agricultural information obtained was most accurate. Where parish boundaries cut occupied tetrads the parishes were grouped. Unoccupied parishes were excluded, although Rooks almost certainly used them to forage. Nevertheless, this admittedly crude exercise revealed a significant correlation between density of Rooks' nests and stocking rates within occupied parishes ($r_S = 0.52$, $n = 13$, $P < 0.05$). Furthermore, similar analyses of nest density against the proportion of rough grazing or the numbers of sheep or cattle showed no correlation. This suggests Rooks may be attracted by the increasingly intensive grassland management which normally accompanies rising stocking rates.

Table 7. The numbers (and %) of nests in the river catchments in North Ceredigion at intervals from 1975 to 1994. The river catchments are shown on Figure 1.

Year	*Wyre*	*Ystwyth*	*Rheidol*	*Clarach/Leri/Dyfi*	*Total*
1975	153(8)	829(44)	462(25)	431(23)	1875
1980	245(11)	1108(48)	412(18)	543(23)	2308
1985	306(13)	1019(43)	514(21)	540(23)	2374
1990	338(15)	891(39)	403(18)	661(28)	2293
1994	352(16)	886(40)	388(17)	607(27)	2233

The overall pattern of change in the study area also supports this view. Stocking rates in the whole of Ceredigion increased by 3% per a year from the 1950s to 1982 and then dropped to a rise of no more than 1% annually. The change in nest numbers in the study area since 1975 has shown a similar pattern, with a rapid rise to the mid 1980s and then levelling out (Figure 2).

Table 6 shows a 63% drop in the amount of tillage in the study area, but, because tillage (63% of which was cereals in 1978, chiefly Barley, Oats and Wheat, and 72% in 1988) never occupied more than 2.9% of the area, this will have had a negligible effect on Rook numbers.

DISCUSSION

A strong element of site selection for rookeries is evident with regard to a variety of both geographical and man-made features of the landscape in the study area. Rookeries tend to be sited at low altitudes in valleys, mostly in woods but also in smaller groups or rows of trees on level ground or on moderate slopes. They tend to be well away from the coast. They are almost invariably close to occupied buildings, and seem to favour the proximity of busy roads and working farms. However, there seems to be no particular tendency for rookeries to be commoner in and around villages, or the town of Aberystwyth, than elsewhere. Rookeries are largely absent from land over 200 m, from the plateaux, from the coastal fringe, from very exposed sites, and from uninhabited parts of the countryside and areas remote from roads. On the other hand, there appears to be no preference for particular land uses in the areas occupied, probably because the lowland parts of the study area are a fairly uniform mix of improved and unimproved pasture, woodland and very small amounts of arable land.

Different rookeries behave very differently as regards roosting and feeding, and in how much of the year birds remain at the rookery, making it impossible to estimate accurately the size of the area that rookeries use. For example, the two largest rookeries in the survey were at Aberllolwyn, SN 588774, and Crugiau, SN 592794, only 2 km apart in the lower Ystwyth valley. At Aberllolwyn, except during the breeding season, Rooks were in residence only intermittently, usually both feeding and roosting away, and often being absent for a couple of months at a time. At Crugiau Rooks were normally always about the rookery, and roosted there all the year round. Furthermore, nesting started one to three weeks earlier at Crugiau, although paradoxically it appeared to be a rather more exposed site.

Sage & Vernon (1978) discuss the kinds of trees used by nesting rooks recorded in the 1975 national rookery census. In Wales the most popular trees were, in order, Oaks (22.1%), Ash (21.4%), Sycamore (18.1%), Scots Pine (13.1%), Beech (11%), and Elms (7.2%). Total conifers were 15.3% (excluding unidentified species). Their "Scots Pine" category probably includes Corsican/Austrian Pine, and is thus equivalent to "Pines" in the present study. Compared with Wales as a whole, North Ceredigion in 1975 had about twice as high a percentage of nests in Oak (46.1%) and in Pine (24.5%) (but the latter falling to about the same percentage (14.5-16.9%) by 1990-94), half the percentage in Ash (10%, but rising to the same percentage by 1994), a third of the percentage in Sycamore (6.3%), rather less in Beech (8.1%), and much less in Elm (1.8%). Sycamore is probably a much commoner tree in lowland Ceredigion than Beech, so the popularity of Beech as a nesting tree in North Ceredigion seems to indicate a local bias. Lovegrove *et al* (1994) comment that Scots Pine appears to be disproportionately favoured, in relation to its abundance, in Wales as a whole. This seems even more true for North Ceredigion where, in large rookeries in mixed woodland, large concentrations of nests often occur in Pine trees. On the other hand, even in pure Oak or Beech woods individual trees frequently have large concentrations of nests which usually persist over 10 or more years.

The significant move out of Pines and into Ash is probably directly related to the changing status of these trees in the countryside. Pines, and Scots Pines in particular, have decreased in the area during the study period, chiefly because many of the predominantly late nineteenth century plantings were coming to the end of their natural life: this is

especially true in mixed estate woodland where they may be overtopped by broadleaves, and in exposed sites. In several of the larger rookeries, notably at Crugiau, SN 592794, most of the Pines have died and many have fallen during the period. Ash, on the other hand, has regenerated in many of the woods clear-felled during the 1939-1945 war, and the trees reached a suitable size for nesting during the study period. Apart from Sitka Spruce (see below), Oak is by far the most abundant tree in the study area, and is obviously suitable for rookeries as its position at the top of the table indicates. The fact that the increase in nest numbers has been in Ash rather than Oak suggests either a positive selection for Ash or that the distribution of Ash is biased towards areas favoured by Rooks. Sycamore has probably increased in the landscape in the same way as Ash, but has not increased as a nesting tree to the same degree.

There has been a decrease in the percentage of nests in Elm, presumably caused by the loss of Elms to disease, but Elms have never been a very significant feature of the landscape in this area and their loss has had only occasional local impact on the Rooks. (The slight increase of use of Elm from 1975 to 1980 is unexplained and perhaps of no significance).

Although there have been a number of rookeries in isolated conifers, conifer copses and shelter belts, and many nests in conifers in mixed copses and woodlands, none have been in Forestry Commission or other large conifer plantations. Except for reducing grassland feeding areas in the uplands, conifer afforestation seems likely to have had little effect on Rooks. The only rookery in what might pass for a conifer plantation was at Frondeg, SN 574758, but this plantation was a miserable 2 acre mixture of ill-grown, weather-beaten Sitka Spruces (*Picea sitchensis*) and Pines, most of which have recently been felled. In view of the extensive conifer plantations throughout the study area, there is clearly a very strong aversion to their use by Rooks. Sitka Spruce is probably the most abundant tree in the study area yet has never held more than 2.5% of the nests. Although most of the large plantations of this species are in the uplands, there are many in the lowlands where one might expect rookeries. It is however, an uncommon tree in mixed woodland and the absence of nests may well reflect the aversion to conifer plantations rather than to Sitka Spruce in particular. The lack of interest in such plantations is probably true of Wales and Britain as a whole. Avery & Leslie (1990), in their study of the relationship between birds and forestry, do not even mention Rooks.

The Rook population in Britain as a whole showed a general increase from the 1930s into the 1950s; from the mid-1950s to the mid-1970s there was a general decrease (Sage & Vernon 1975), followed by a slight recovery at least in some areas up to the national sample survey in 1980 (Sage & Whittington 1985). North Ceredigion, with the same average of 3.3 nests per km^2 as for Britain as a whole, showed an increase of 23% in nests numbers between 1975 and 1980, compared with the increase of 6.8% for Britain suggested by Sage & Whittington. After 1980, the numbers continue to rise, although on a much weaker trend. This rise is largely countered by the sudden fall in 1994 so that the overall trend from 1980 to 1994 is not statistically significant ($r_S = 0.35$, $n = 15$, ns).

Lovegrove *et al.* (1994) show that while there was a decline in Rook numbers in Wales from the 1930s to the mid-1940s (in contrast to an increase in England), there was probably then an increase up into the 1960s, followed by a sharp decrease in the years immediately preceding the 1975 survey. They cite surveys showing an increase in Monmouthshire of 30% between 1980 and 1985, and a mean increase of 52% in the size of a third of the rookeries in Montgomeryshire between 1975 and 1991. In Pembrokeshire, surveys in 1944-1946, 1971, 1975-1976 and 1986-1993 indicated that the population had remained fairly stable (Donovan & Rees 1994). The present survey in North Ceredigion shows a general increase amounting to about 30% between 1975 and the mid 1980s (Figure 2). Chater *et al.* (1974) have already shown that there was almost certainly an increase in nests between

1913-1916 and 1959-1967. The average number of nests per rookery in the 1975 B.T.O. survey was 24.4 for England, 78.9 for Scotland, and 25.2 for Wales (Sage & Whittington 1985). For North Ceredigion in 1975 the average from this survey, using comparable 100 m spacing between rookeries, was 38 nests per rookery (51% higher than the Wales average), rising to 40 in 1976 and 1980.

Brenchley (1984) demonstrated that the optimum balance of land-use for Rooks was 55% grass and 45% arable, and commented that Rook populations have declined most in areas of increasingly specialised arable farming, and least in regions of least agricultural change. O'Connor & Shrubb (1986) explained that as Rooks in areas of high cereal production take fewer animals and more cereals in their diet than those in more pastoral areas, changes in cereal-growing will affect most severely Rooks in the former areas. In an area such as North Ceredigion where tillage as a whole is of such little importance, even a 63% decrease can therefore be expected to have had little impact on the Rooks. The same authors explain that the widespread switch to autumn sowing of cereals has depressed food availability during the breeding season; again, this change is very evident in Ceredigion but for the same reasons will have had little effect.

Lovegrove *et al.* (1994) state: "The current Rook population is Wales is probably at the sort of density which is sustainable in a strictly pastoral environment." This is probably generally true for North Ceredigion, but the present survey shows with a fair degree of certainty that within such a predominantly pastoral economy changes in management can have a marked effect on Rook numbers. Increases in stocking rates were closely correlated with increases in nest numbers. There may be several reasons for this. Dung-feeding invertebrates that form an important part of the diet would have increased. Judging by the frequency of molehills on reseeded pastures, earthworms are another major food item that would have increased. The ploughing and reseeding associated with increased stocking would in itself have presented Rooks with some of the benefits of tillage, in that invertebrates would have been exposed and grass seed made available. Feeding of concentrates to sheep may also have been a benefit. My impression is that Rooks are seen preferentially feeding on these pastures both during and for some years after reseeding.

Reasons for the colonisation or desertion of a site by a rookery are not understood. Human persecution occasionally coincides with desertion, especially when the trees involved are felled, and in such cases the rooks sometimes build in neighbouring trees, or may even leave the site altogether. Many more desertions, or movements of nesting sites within rookeries, occurred where no human interference was recorded. Regular annual shooting appears to have no effect on most rookeries where it takes place. I have been unable to find any single unambiguous reason for the desertion of any rookery during the survey. In all cases where some event suggests itself as a cause for desertion, one can find apparently comparable cases where similar events have not caused desertion. As a decline in numbers typically precedes desertion for a number of years, the causes may well often be long term and dependent on a combination of circumstances.

Yapp (1951) and others have commented on the way in which total population size can remain steady in spite of striking instability of individual rookeries. In the present study the population proved not only to be able to maintain itself, but even to increase as successfully in areas where the rookeries were very unstable as in those where they were relatively stable.

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THE STATUS OF THE BLACK GROUSE *Tetrao tetrix* IN WALES IN SPRING 1995 TOGETHER WITH POPULATION CHANGES SINCE 1986

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SUMMARY

A survey of Black Grouse in Wales in April-May 1995 showed a total of 153 displaying males at 82 lek sites with a further 11 non-leking males and 21 females. Over half the leks held single males and the bulk of the Welsh population was recorded in Meirionnydd (45%) and Denbighshire (34%).

A comparison between the 1995, 1992 and 1986 survey results show similar percentage decreases in the numbers of displaying males and the number of females but a significantly sharper decline in the numbers of non-leking males between 1986 and 1992. The decrease in number of displaying males has been most severe on the Berwyn moors (-75%) where Black Grouse continue to be shot on some estates. The intensively game-keepered Ruabon moor supported one of the few stable populations in Wales.

The maturing of upland plantations and the agricultural improvement of moorland are believed to be the two major causes for the decline.

INTRODUCTION

Prior to the 1980s, little was known about the status of Black Grouse *Tetrao tetrix* in Wales but it was believed that the population was in decline, following an extension in range and numbers in the 1950s and 1960s probably linked with new conifer plantations (Hope Jones 1989). The first national census in Wales was undertaken by the Royal Society for the Protection of Birds (RSPB) in 1986 (Grove *et al.* 1988), the results showing a total of 232 displaying males on 91 leks and an additional 32 non-leking males. Allowing for leks which were probably missed by the survey, the true total was believed to be higher than 300 males (Grove *et al.* 1986).

Annual or biannual sample monitoring of selected leks was subsequently undertaken in north Wales (Walker 1988, Williams 1990) and it became apparent that the population was continuing to decline. As a result of this, a second national survey funded by the RSPB and the Countryside Council for Wales (CCW) was carried out in 1992 (Williams *et al.* 1992). The results of this survey have been reassessed following a reanalysis of the raw data and now show a total of 204 males on 110 leks with a further 15 non-leking males. The true

decline is likely to be greater than the figures suggest as coverage was believed to be more comprehensive in 1992.

In 1995, the RSPB organised the third national Black Grouse census in Wales as part of a UK-wide survey organised by the RSPB, Game Conservancy Trust, Scottish Natural Heritage, English Nature and Joint Nature Conservation Committee.

METHODS

As for both previous national surveys, displaying male Black Grouse (Blackcocks) were used as the count unit due to their conspicuousness at lek sites on early spring mornings. Females and non-leking males were also recorded. Counts were made between an hour before and two hours after dawn in April and early May, following the guidelines recommended by Cayford & Walker (1991). A minimum of one visit was made to each site but some sites received up to 3 visits.

All observations were made on still, clear mornings and, as displaying males are audible over long distances, it is unlikely that many were overlooked in the areas surveyed. The 1986 and 1992 surveys formed the basis for the selection of sites to be visited and all suitable areas within 5km^2 of past lek sites were walked. Additionally, all other seemingly suitable upland areas were surveyed at least once.

Observers were asked to complete a recording form for details of each site visited. For the purpose of the survey, a lek was taken to mean an area where one or more male Black Grouse were seen displaying. Birds found displaying at a distance of 200 metres or more apart were considered to be occupying separate leks. Where multiple visits were made to a lek, the maximum number of males on any one visit was recorded, following the methods used in 1986 and 1992.

RESULTS

The 1995 survey

A total of 153 Blackcock were found displaying on 82 leks. Forty seven of the leks (57%) involved single displaying males and the largest recorded was of 11 males on a moor in Denbighshire (Table 1). An additional 11 males were recorded away from the leks, giving a total of 164 Blackcock in Wales.

Table 1. The numbers of displaying male Black Grouse and the number of leks recorded in Wales in spring 1995.

	Number of males at lek							
	1	*2*	*3*	*4*	*5*	*7*	*8*	*11*
Number (and %) of leks	47(57)	23(28)	4(5)	3(4)	2(2)	1(1)	1(1)	1(1)
Number (and %) of males	47(31)	46(30)	12(8)	12(8)	10(6)	7(5)	8(5)	11(7)

Twenty-one females (Greyhen) were recorded at leks during the survey period and 4 were recorded away from the display sites, giving a total of 25. Comparison with the 164 males gives a ratio of 6.6 males to one female although this is not believed to be a true reflection of the sex ratio as a higher percentage of males are recorded on the lek at any one time.

Table 2 shows that Meirionnydd and Denbighshire between them hold 80% of Welsh Black Grouse with the small outlying populations of Dyfed now confined to north Ceredigion and the Powys population confined exclusively to Montgomeryshire. The

species is virtually extinct in Caernarfonshire with only 3 males and one female located in the county during the survey.

Table 2. Numbers and distribution of Black Grouse in Wales in spring 1995 by vice county.

County	*Number of leks*	*Males on leks*	*Non-leking males*	*Total males*	*Number of females*
Caernarfon	3	3	0	3	1
Ceredigion	4	7	0	7	1
Denbigh	20	57	2	59	10
Meirionnydd	46	69	8	77	9
Montgomery	9	17	1	18	4
Total	**82**	**153**	**11**	**164**	**25**

Population changes 1986-1995

Black Grouse have declined rapidly in Wales between 1986 and 1995 (Table 3). Work undertaken by the Game Conservancy in the north of England and parts of western Scotland has shown that similar declines have been recorded throughout much of its range in Britain (Baines & Hudson 1995). In Wales, the 1992 and 1995 surveys used identical methods and

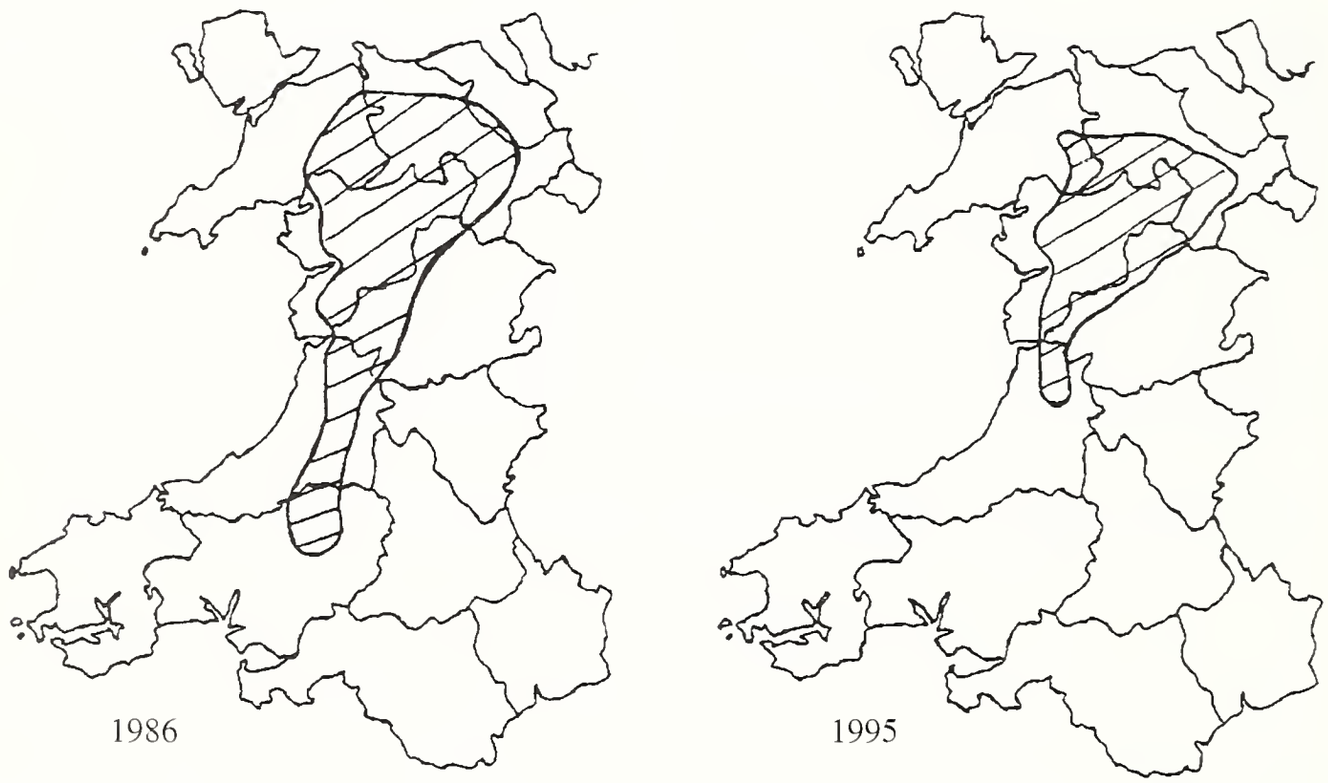

Figure 1. The distribution of Black Grouse leks in Wales (shaded areas) in 1986 and 1995 by Watsonian vice-county.

the results are therefore comparable. In 1986, the methods for censusing displaying males (Cayford & Walker 1991) had not been clearly defined, so the results of the survey should be regarded as minimum figures, as should the recorded decline between 1986 and 1995.

The geographical distribution of Black Grouse in Wales has changed markedly since 1986 (Fig. 1). It has become extinct in Carmarthenshire, and in Ceredigion it is now confined to a few scattered sites in the extreme north of the county. In the north, the small,

isolated population has disappeared from the Clwydian Range despite a shooting ban and it is now very scarce in the former stronghold of Caernarfonshire.

Table 3. The numbers and distribution of male Black Grouse in Wales 1986, 1992 and 1995 by vice county.

	Number of males			*Change*
County	*1986*	*1992*	*1995*	*1986-1995*
Caernarfon	7	10	3	-57%
Carmarthen	4	1	0	-100%
Ceredigion	13	13	7	-46%
Denbigh	96	65	59	-39%
Meirionnydd	126	113	77	-39%
Montgomery	18	17	18	nc
Total	**264**	**219**	**164**	**-38%**

The decline in numbers has been marked throughout most of Wales although, as expected, the largest percentage declines have been in counties such as Carmarthenshire and Caernarfonshire which held small, relict populations during the initial survey in 1986. The only county supporting a stable population is Montgomeryshire where most birds are confined to the recently afforested Llanbrynmair moor. As the trees grow, this area will become less suitable, especially as the heather outside the forestry is overgrazed (Harris & Williams 1995), and the birds will disappear unless appropriate management is carried out. Meirionnydd and Denbighshire have consistently held the bulk of the Welsh population (Table 3).

The increased or stable populations recorded in Caernarfonshire and Ceredigion between 1986 and 1992 are likely to be due to better coverage during the second survey. The decline appears to be accelerating as a decrease of 17% was recorded for the 6 years between 1986 and 1992 but the figure for the 3 years between 1992 and 1995 is 25%. However, this again may be due to better coverage in 1992 than in 1986. Grove *et al.* (1986) believed the true population in 1986 to be in excess of 300 males. If this were so, the true decline between 1986 and 1992 would be 27% and the total decline between 1986 and 1995 would be 45%.

Table 4. The average size of Black Grouse leks and the percentage of leks holding single males in Wales in 1986, 1992 and 1995.

	1986	*1992*	*1995*
Average number of males per lek	2.6	1.9	1.9
% of leks with single males	47	62	57

Table 4 shows a decrease in average lek size and an increase in the proportion of leks with single males since 1986. Although the differences shown are not quite statistically significant, perhaps largely because of poorer coverage in the 1986 survey, the pattern is consistent. Grove *et al.* (1988) believed such a predominance of single male leks to indicate a declining population and the Welsh population trend clearly conforms to this idea, with a major decline over the period.

All 3 national surveys recorded similar percentages of females although the actual numbers declined in parallel to the numbers of males (Table 5). However, the proportion of non-leking males was significantly higher in 1986 than in 1992 and 1995 (chi^2 = 4.38, df1,

P<0.05). This may be due to lek counts being undertaken outside the optimal time of day in 1986 or it may indicate that there are fewer surplus males available to make up losses in the breeding population.

Table 5. The numbers of male and female Black Grouse in Wales in 1986, 1992 and 1995. Percentages of other males are of total males and of females are of total birds.

Year	*Total males*	*Males at lek*	*Other males and (%)*	*Number (and %) of females*
1986	264	232	32(12)	41(13)
1992	219	204	15(7)	26(11)
1995	164	153	11(7)	25(13)

DISCUSSION

Although survey methods were refined between 1986 and 1992, the basic principle of visiting likely areas at dawn was adhered to for all 3 surveys. The results are therefore comparable. However, accurate measures of declines and population estimates are often made difficult by variabilities in lek attendance and movements from one lek to another. One site on north Berwyn which was visited 3 times following the standard methods and at appropriate times (Cayford & Walker 1991) held 2, 5 and 4 males respectively. Other males flushed from lek sites were seen to fly distances of over a kilometre and continue leking at new sites.

Nevertheless there is no doubt that Black Grouse are declining in Wales but the exact reasons can only be guessed at. Baines & Hudson (1995) note that increases in sheep numbers are probably a significant factor in the decline in the north of England and the same is likely to be true for Wales where sheep numbers have increased almost threefold to over 11 million since 1945 (Lovegrove *et al.* 1995). Habitat loss through agricultural improvement and maturing forestry have also been suggested as major causes for the decline in Wales (Hope Jones 1989) and elsewhere (Yalden 1986, Baines 1996). Afforestation of the uplands was considered to be the principal reason for the increase in Black Grouse in Wales during the the 1950s and 1960s (Lovegrove *et al.* 1994) but as these trees matured and the area of new planting declined during the 1970s and 1980s, less suitable habitat was available for the species.

It has long been suspected that habitat degradation, combined with the recent increases in the populations of Foxes *Vulpes vulpes* and certain corvids in Wales has had an adverse effect on several ground-nesting birds (Lovegrove *et al.* 1995), including Black Grouse. Cayford *et al.* (1989) found the main proximate cause of mortality of male Black Grouse to be predation by foxes and work in the French Alps has shown that nest losses in Black Grouse are high due to predation (Bernard 1982).

Further research is required to identify the reasons for the continued decline in Wales but some useful information can be deduced by comparing the results from three areas which experience different levels of management (Table 6). The Berwyn moors are extensive areas of managed heather moorland whose game-keepers are now concerned mainly with pheasant *Phaisanus colchicus* rearing on the lower ground. Ruabon moor, however, is intensively managed for red grouse and boasts one of only two full-time upland game-keepers in Wales. Penaran is an area of moorland which was afforested during the late 1970s and where intensive management work to benefit black grouse has been undertaken by the Forest Enterprise during the 1990s. No systematic predator control is undertaken at Penaran although the local fox hunt visits the site in winter.

Table 6. Numbers of displaying Black Grouse in 1986, 1992 and 1995 at 3 sites in Wales with different levels of management.

	No: of displaying males			*Change*	*Level of*	
	1986	*1992*	*1995*	*1986-95*	*Predator control*	*Habitat management*
Berwyn	130	70	33	-75%	medium	medium
Penaran	14	10	6	-57%	low	high
Ruabon	17	24	19	+12%	high	high

The only area which has retained a stable population is Ruabon moor where both intensive heather management and predator control are undertaken. The Berwyn moors, formerly the stronghold for Black Grouse in Wales, have experienced a 75% decline in numbers in 9 years despite the fact that some heather management and predator control to benefit Red Grouse *Lagopus lagopus* are still carried out. An additional reason for the sharp decline on these moors must be that several estates continue to shoot the species despite a moratorium throughout the rest of its range in Wales.

Whatever the reasons for the declines, the latest survey has shown that immediate action is imperative if this species is to survive in the Welsh uplands.

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AUTUMN SEABIRD MOVEMENTS AT POINT LYNAS, ANGLESEY DURING 1976 TO 1993

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SUMMARY

Seabird numbers were recorded systematically for 18 successive autumns, usually from August into December, and in a wide range of weather conditions. Divers and sea-ducks were also counted. The data from 489 watches (1,204 hours) are analysed to show relative species abundance, migration seasons, diurnal movement patterns, and occurrence in relation to wind factors.

More than 354,000 individuals of 36 species were recorded, excluding resident Shags*, Cormorants and the commoner *Larus* gulls. Four species made up 87% of the total: Kittiwake (42.9%), Guillemot/Razorbill (30.6%) and Gannet (13.5%), with the next most numerous being Manx Shearwater (4.6%), Fulmar (3.1%), terns (2.8%), Common Scoter (1.5%), skuas (0.5%) and divers (0.5%).

Virtually all (97%) birds seen were flying west out of Liverpool Bay irrespective of wind conditions. The largest movements (10-15 species and >1,000 birds per hour) occurred during or immediately after strong or gale W - NNW winds. The highest passage rates typically occurred during the first 2-3 hours of daylight. It is suggested that peak passage-days involved mainly birds that had entered the Irish Sea through its narrow North Channel, and then were driven into Liverpool Bay at night by continuing north-westerly winds. At other times autumn passage through the north Irish Sea is probably small-scale and over a broad front. The likelihood that some skuas arrive overland from the North Sea is examined.

INTRODUCTION

Seabird movements in the Irish Sea have been observed from various headlands and islands since the 1960s; many casual records appear in local bird reports. However, few analyses of systematically recorded observations appear to have been published. At Bardsey, movements during standardised time periods through the autumn were analysed in relation to weather conditions and time of day (Rowley & Jones 1980, Jones & Rowley 1981).

On the north coast of Anglesey, Eades (1966) had reported storm-driven seabird movements out of Red Wharf Bay at Moelfre, and past Point Lynas (Fig. 1), in autumn. However, it was Gibbs (1969), in a review of Irish Sea seawatching stations, who first drew attention to the potential of Point Lynas itself following exploratory surveys in 1967-68. At

* Scientific names of species are given in the species list.

Hilbre Island, some 70km east of this point, influxes of petrels and other seabirds during gales have long been recorded (Hilbre Observatory Reports). A consideration of the coastal topography between Anglesey and Hilbre further suggested that Point Lynas should be the most favourable site in north Wales from which to view the 'escape' or re-orientation movements of species blown at night into the south-east corner of Liverpool Bay off Hilbre by westerly and north-westerly gales. With the deep embayment of Moelfre and Red Wharf Bays immediately to its south-east, the coastal features around Point Lynas bear a marked resemblance to those at St. Ives in west Cornwall.

In autumn 1976, I began the systematic recording of seabirds and divers (as well as sea-ducks) passing Point Lynas. This soon became a cooperative exercise each year, with more than 30 observers participating over the next 18 years. This paper summarises the

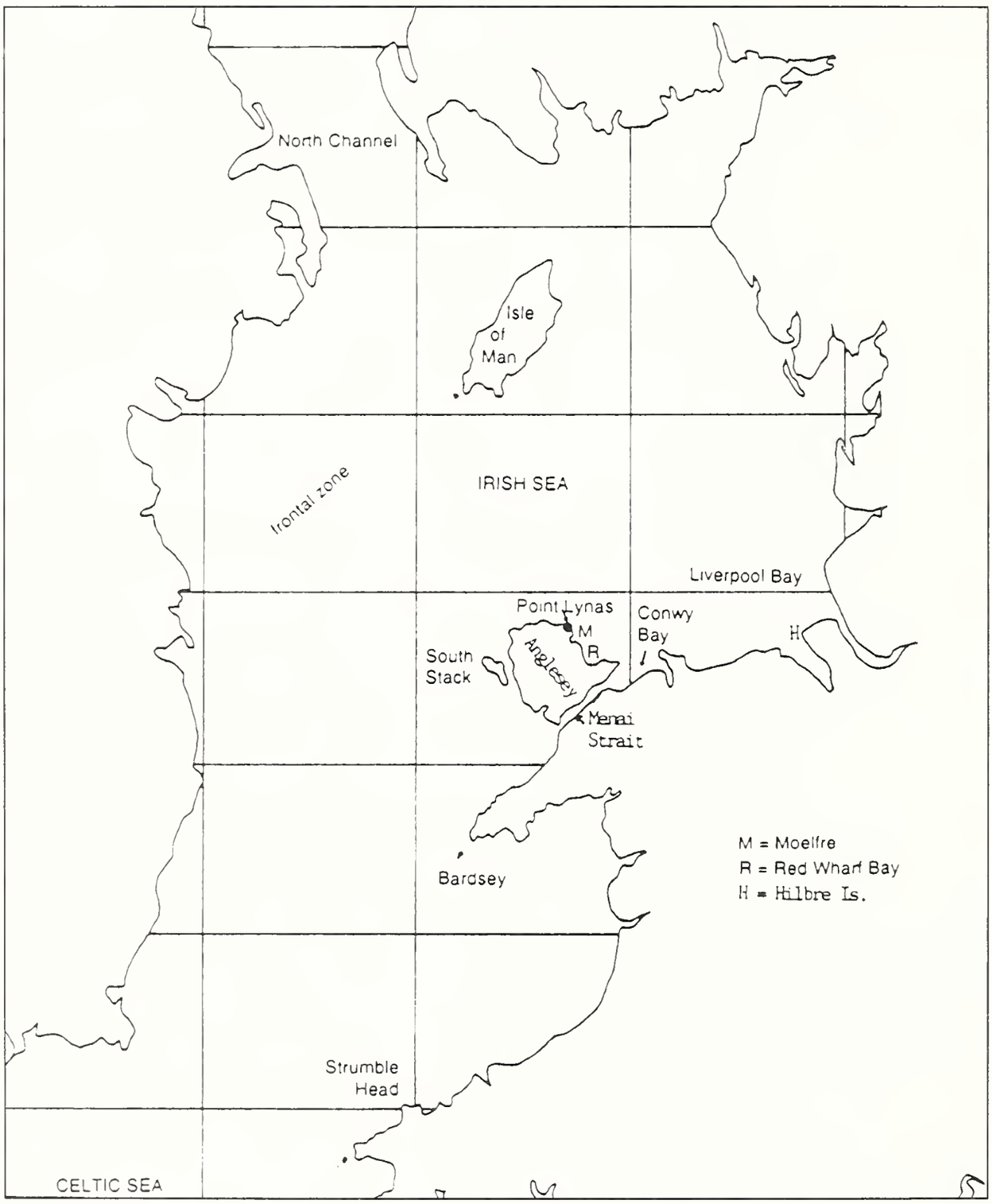


Figure 1. Map of the Irish Sea showing the location of Point Lynas and of other seawatching sites in Wales and NW England.

status of each species and describes the main features of seabird migration at Point Lynas in relation to weather conditions and time of day. Some comparisons are made with observations elsewhere in the Irish Sea.

METHODS

From late July until early December each autumn, observers visited the point as often as possible when 'promising' weather (i.e. strong or gale W and NW winds) was forecast or was in progress. However, many comparative watches were made (some unintentionally!) during lighter onshore winds as well as in offshore breezes. Such watches reduced the bias towards onshore gales and provided a broader picture of movements under more typical conditions.

Watches started normally at first light and lasted from 1-8 hours, average 2.5 h, depending on weather and the volume of passage. Some afternoon and early evening watches were also undertaken during August and September. The best vantage points were 5-20m above sea level at the north-east tip of the promontory.

Bird numbers were logged in 30 or 60 minute periods on many watches so as to show diurnal patterns and to relate movements to changing weather states. Wind direction and force (Beaufort scale) were estimated from sea state and the wind vane on the lighthouse at the point. Light and visibility normally were very good. Most observations were transcribed later to standard recording forms, and sent to P.J.D. for analysis and compilation of an annual summary in the Cambrian Ornithological Society (later Gwynedd) Bird Reports (Dare 1979 *et seq.*). Certain inshore species were not counted: Shag, Cormorant and the commoner *Larus* gulls, many of which were daily commuters from nearby roosts.

Over the 18 autumns, observer effort totalled 489 watches (407 in mornings) and 1,204 hours (Table 1). The main effort spanned August to October (76% of watches) with less than 5% in July and December. Annual coverage varied widely, but averaged 27 (range 11-50) watches and 67 (range 28-136) hours per autumn. Coverage was 50% higher during 1980-85.

Table 1. The monthly distribution of observer effort in autumn seawatches at Point Lynas, Anglesey, during 1976-1993.

	July	*August*	*September*	*October*	*November*	*December*	*Totals*	*Average per autumn*
Number (and %) of watches	18(4)	103(21)	144(29)	126(26)	74(15)	24(5)	489	27
Number (and %) of hours	28(2)	228(19)	398(33)	330(27)	179(15)	41(3)	1204	67
Mean number hours/watch	1.5	2.2	2.8	2.6	2.4	1.7		2.5

Note: 82 watches (17%) were in afternoons and/or early evenings during July to September.

Wind parameters are grouped into 5 compass sectors (Fig. 2):- (i) north-west = winds from WNW-N inclusive, (ii) westerly = WSW-WNW winds, (iii) south-west = WSW-S winds, (iv) south-east = SSE-ESE winds, and (v) north-east = ENE-NNE winds. During the study, onshore NW sector winds (expected to be the most productive for rarer species) occurred on 50% of watches, ranging between months from 36% (August) to 61% (July). Alongshore westerlies occurred on 15% of occasions, and SW sector winds on 23%. Only 14% of watches coincided with SE and NE winds blowing out of Liverpool Bay.

To examine the effect of wind direction on seabird abundance at the point, only data from morning watches were used. For easier illustration in the species accounts the data for

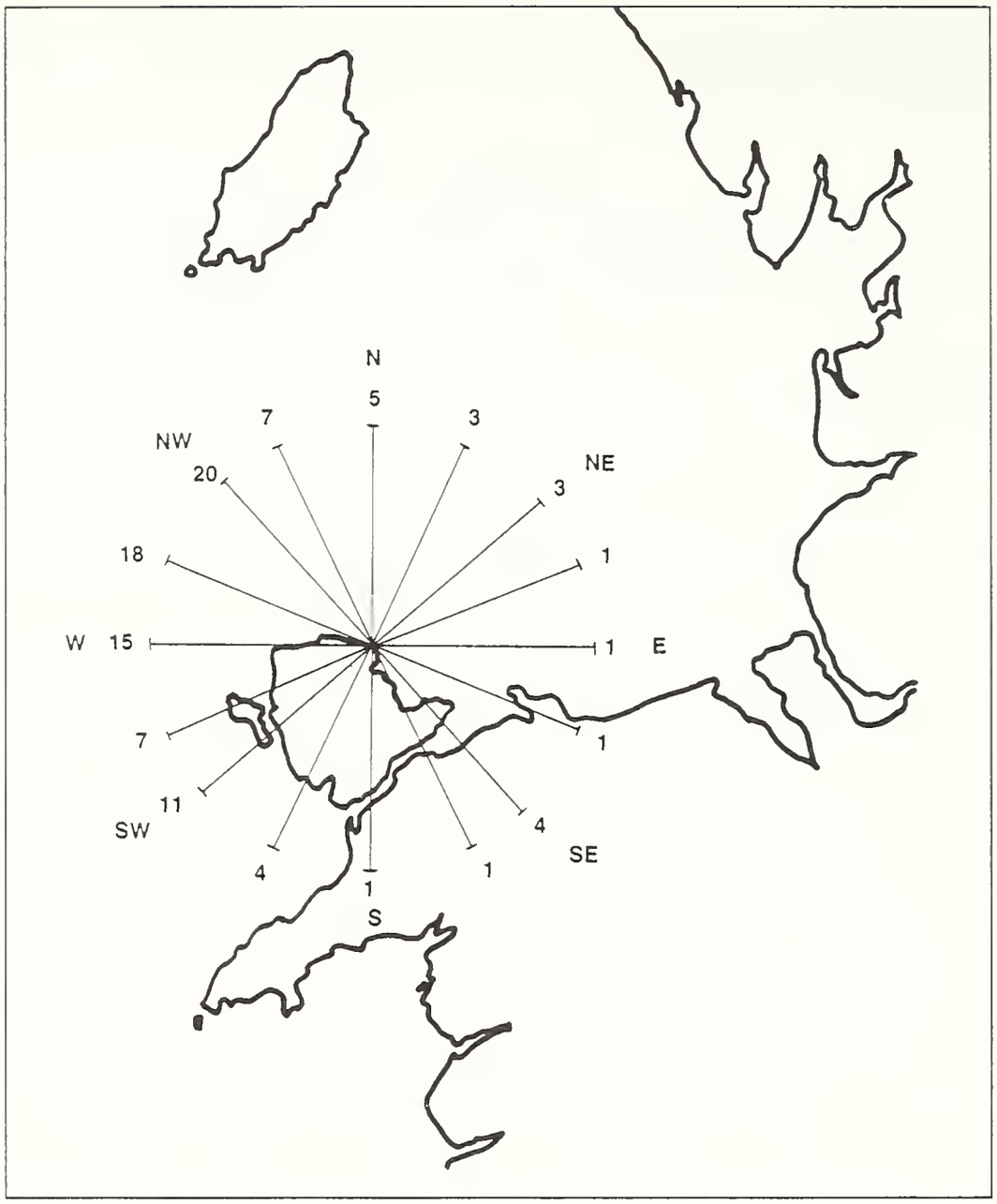


Figure 2. Map of the north Irish Sea showing the directional frequency (%) of winds at Point Lynas during autumn seawatches, 1976-93.

the 5 wind sectors have been combined so as to provide a 3-way comparison between: (a) onshore north-west plus westerlies (N-WSW), (b) south-westerlies (WSW-S), and (c) offshore easterlies (SSE-NNE). The mean numbers of birds passing per hour were calculated for each wind sector over successive 20-day periods and for all autumns combined. These results also show the seasonal pattern of the migration for each species.

RESULTS

General features of seabird movements

More than 354,000 individuals of 36 species of seabirds, seaducks and divers were recorded (Table 2). Six species made up 94% of the assemblage — Fulmar, Manx Shearwater, Gannet, Kittiwake, Guillemot and Razorbill. Approximately 97% of all birds seen were flying W, care being taken to exclude foraging Gannets and terns passing to and fro. Table 2 also gives details of the largest day and one-hour counts for all species (see below).

As expected, the largest movements, sometimes involving 10 to 15 species and more than 1,000 birds per hour, occurred on mornings with strong or gale W-NNW winds and

Table 2. The total number of seabirds, divers and sea-ducks recorded at Point Lynas, Anglesey, during systematic seawatches in autumn during 1976-1993. Species are listed in order of abundance.

Species	*Total birds*	*Relative abundance (%)*	*% flying west*	*Maximum count per:* *watch*	*hour*
Kittiwake	152250	42.9	99	6200	3125
Guillemot/Razorbill	108500	30.6	99	6455	1940
Gannet	47860	13.5	96	1282	705
Manx Shearwater	15900	4.5	99	3000	773
Fulmar	11105	3.1	96	1500	531
Common Scoter	5280	1.5	85	1132	315
Common/Arctic Terns	5147	1.5	98	331	100+
Sandwich Tern	4546	1.3	94	300	100+
Red-throated Diver	1437	0.4	94	86	26
Arctic Skua	1171	0.3	97	39	25
Great Skua	717	0.2	98	78	39
Leach's Petrel	291	0.1	99	181	60
Red-breasted Merganser	141		96	8	4
Great Northern Diver	115		91	5	4
Pomarine Skua	91		98	7	4
Skua spp (unidentified)	83		95	5	2
Little Gull	41		98	8	4
Black Tern	35		100	5	5
Storm Petrel	27		96	12	3
Sooty Shearwater	22		100	9	6
Scaup	21		100	9	9
Sabine's Gull	17		94	2	2
Little Tern	14		100	5	5
Velvet Scoter	14		86	3	3
Eider	13		62	4	3
Black Guillemot	13		85	3	1
Mediterranean Shearwater	8		100	3	2
Long-tailed Duck	7		100	1	1
Black-throated Diver	6		100	2	2
Long-tailed Skua	4		100	2	2
Mediterranean Gull	4		75	1	1
Cory's/Great Shearwater	4		100	1	1
Puffin	3		67	1	1
Little Auk	2		100	2	2
Storm/Leach's Petrels	2		100	1	1
Great Shearwater	1		100	1	1

Notes: Where relative abundance is not shown it was less than 0.1%.
The total of 354,894 individuals includes 2 unidentified seabirds which were probably albatrosses but neither specifically identified nor accepted by *Brit. Birds*. They are not listed in the table.

often following an overnight veer from south-west. Under such conditions, most birds passed within 400 m of the point, and often within 50-100m, as they beat into wind out of Red Wharf Bay. Many Gannets, Kittiwakes, skuas, auks, Fulmars (and Leach's Petrels once) would skirt close to the rocks, whilst a few Gannets and skuas even flew over the point itself. By contrast, in offshore winds birds usually were scattered well offshore.

During large westerly passages, peak numbers were observed typically within the first 2-3 hours after dawn, and movement thereafter eased often quite rapidly. This was particularly evident for the commonest species—Gannet, Kittiwake and auks (Figs. 3-4). On an average morning, relatively few birds passed after 11.00 h. However, a reduced passage sometimes would continue through the afternoon and into the evenings, especially during days of NW winds.

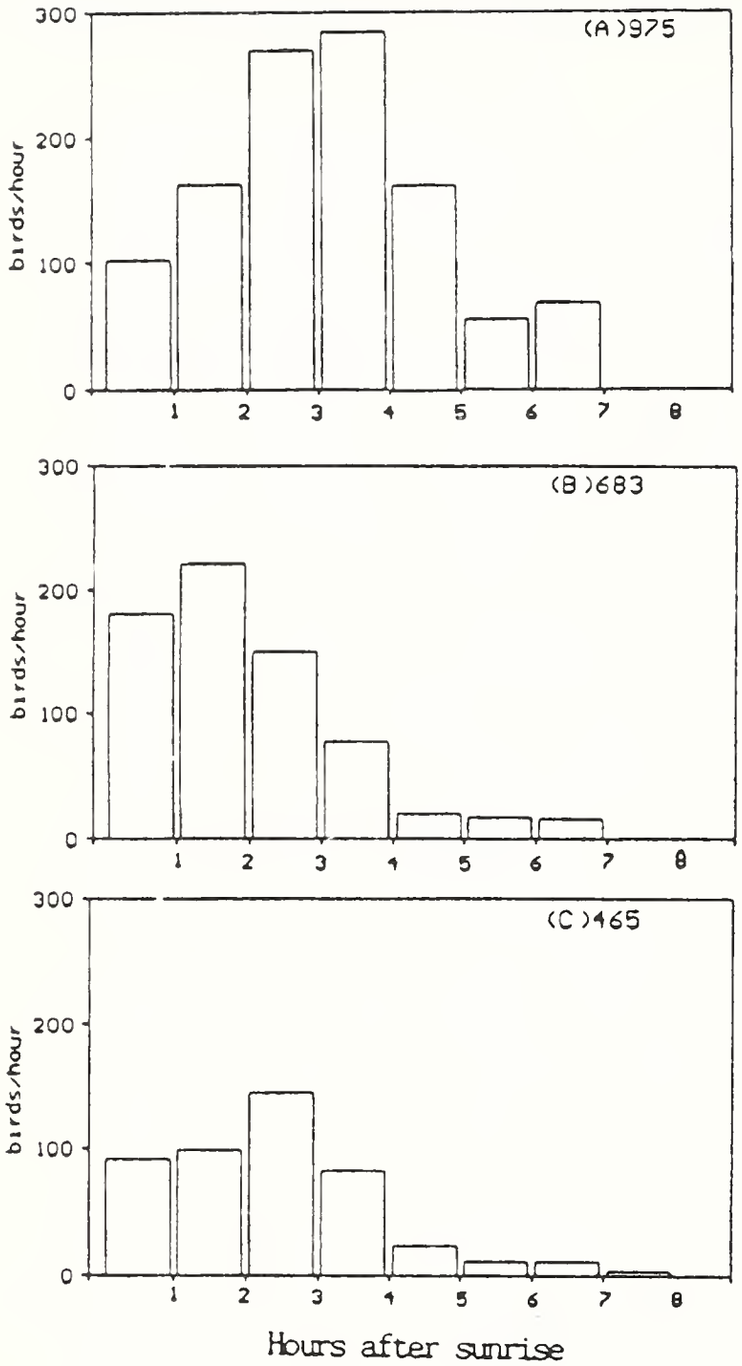


Figure 3. Hourly passage rates of Gannets during 3 large westerly movements at Point Lynas:
(a) 10/9/84, wind NW7-8;
(b) 2/10/77, wind WNW5-6;
(c) 30/9/78 wind WNW8.
Counts are plotted for successive 1-hour intervals after sunrise at Liverpool. Total numbers are also shown.

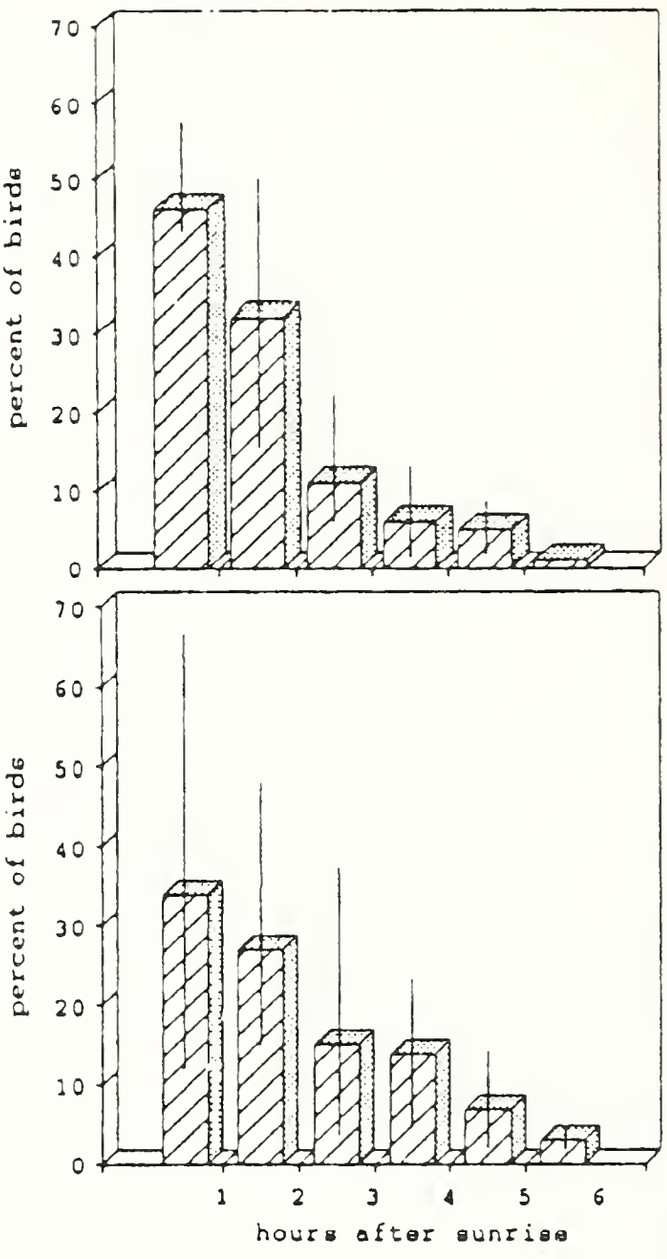
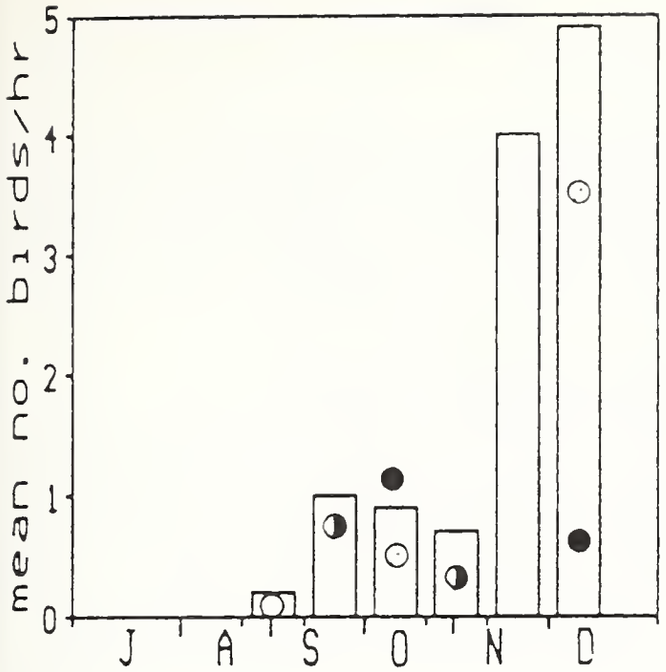


Figure 4. Mean hourly passage rates after sun rise at Point Lynas of Kittiwakes (top, based on 4 movements each exceeding 1500 birds) and Guillemots/Razorbills (bottom, 5 movements of 2500 birds or more). The mean % of all birds passing in successive hours is shown; vertical bars demote the range of values.

SPECIES LIST

In the following systematic list the overall seasonal patterns of movement for the principal species are shown by histograms. Each shows, for successive 20 day periods, the mean number of birds recorded per hour during mornings with onshore (NW or W) winds for each 20 day period from July to December. For comparison, mean passage rates during SW winds (filled circles) and offshore (E) winds (open circles) are also given; half-filled circles indicate similar values for each category.



Red-throated Diver *Gavia stellata*

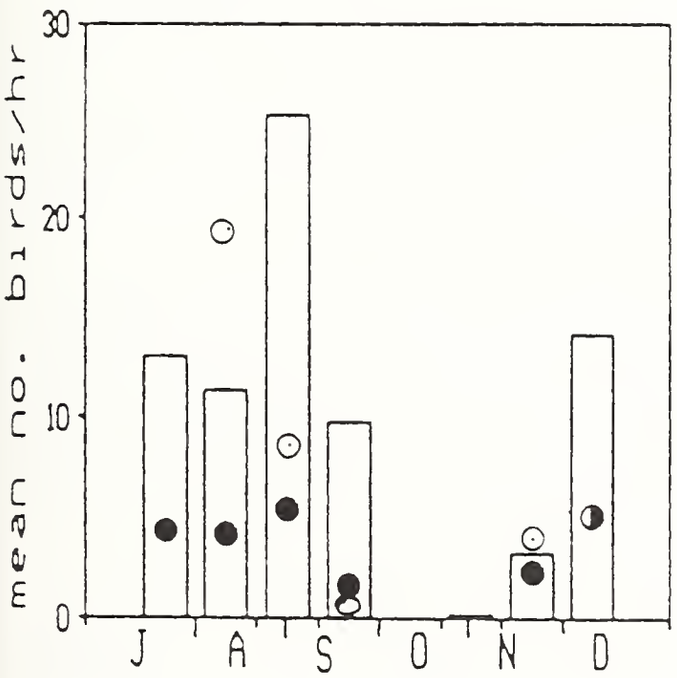
Of the 1557 divers recorded, 1437 (92%) were certainly (936) or presumed Red-throats. Fairly common, with up to 155 birds per season, from mid September into December. The earliest return date was Aug. 24th. The largest movements were in late November - early December, with NW-NE winds, *eg* 86 in 3 hours on Nov. 23rd 1987; mean passage rates of 11.5 birds/hour were noted then in offshore winds. Up to 11 birds were seen in a group and wailing cries were heard from small groups passing almost overhead. Occasionally moved in the afternoon but seldom seen on the sea.

Black-throated Diver *G. arctica*

Although perhaps under-recorded, very scarce and irregular with only 6 birds flying W as follows: Nov. 17th 1982, Sept. 28th 1988 (2), Nov. 9th 1991, Nov. 11th 1992 (2). There were also singles on the sea on Nov. 1st 1986 and Oct. 4th 1987 and at least 5 probables have occurred.

Great Northern Diver *G. immer*

Scarce but annual migrant, averaging 6 birds per autumn, max. 15 in 1978, and comprising 7% of all divers seen. The first birds return in breeding plumage, usually in mid to late September but an early bird occurred on Aug. 16th 1993. Most occur in November-December with WNW-NNE winds, with up to 5 per morning and 3 together. Some pass over high and follow the coast and one arriving from the NW flew into Moelfre Bay.



Fulmar *Fulmarus glacialis*

Common from July to September, then virtually absent in October and early November, but more numerous again from late November through the winter. The largest movements occurred during strong or gale-force NW sector winds in late August and early September, *eg* 1500 in 5 hours on Aug. 21st 1988 and 1045 in 3½ hours on Sept. 7th 1990; up to 350 were seen during afternoon watches.

Great Shearwater *Puffinus gravis*

One flew W in the afternoon of Aug. 30th 1982 less than 400 m offshore, wind NW7 (RWA, DSF, EISR).

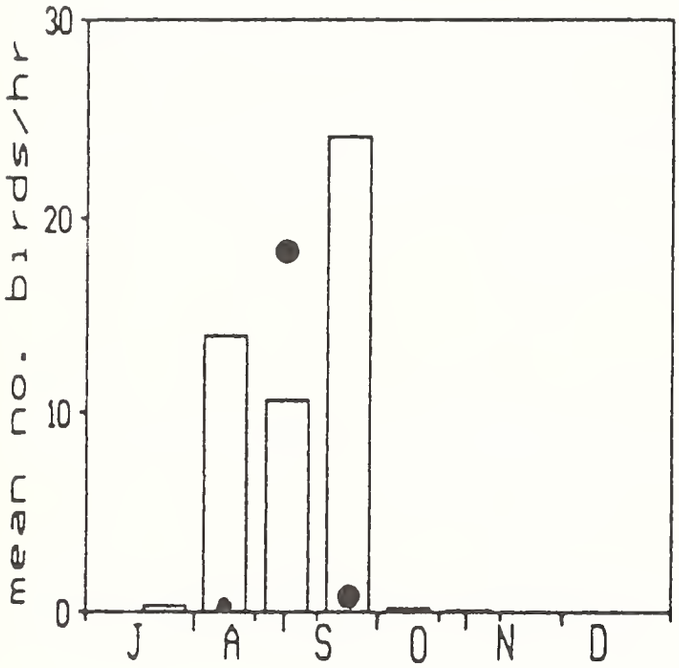
Large Shearwater spp.

There were 4 records of large pale brown shearwaters, either Cory's Shearwaters *Calonectris diomedea* or Great Shearwaters, flying W far out; 2 were almost certainly Cory's Shearwaters. Dates

were Sept. 6th 1980, wind SSW6 (EISR), Sept. 21st 1980, wind NNE5 (TG), Aug. 25th 1985, wind NW7 (GJ) and Sept. 7th 1990, wind NW6-8 (RWA).

Sooty Shearwater *P. griseus*

Scarce but possibly annual visitor, recorded in 9 years and annually during 1982-90. Normally one or two per year but 10 in 1984, including 9 on the morning of Sept. 10th. Virtually all were recorded during strong to gale force NW sector winds and between Aug. 5th and Oct. 10th, except a very late bird on Nov. 23rd 1986. Monthly totals were: August (3), September (17), October (1) and November (1).



Manx Shearwater *P. puffinus*

Fairly common, sometimes numerous, on summer evenings, especially with strong NW sector winds. These deflect Welsh breeders en route south from their feeding grounds SW of the Isle of Man to colonies on Bardsey and the Pembrokeshire islands into Liverpool Bay (E.I.S. Rees *pers comm*). Movements of 1100-1200 birds in 2 hours occur on some evenings in July/August. Morning movements (see figure) were usually much lower, with an hourly rate averaging 20% of the evening flow. However at least 3500 flew W in 8 hours from dawn on Sept. 13th 1988, wind NNW7 easing. Scarce by mid October, with stragglers into early November. An exceptionally large and late passage involving 202 birds in 3 hours, occurred on Nov. 14th 1982.

Mediterranean Shearwater *P. yelkouan*

Eight birds, mostly in late August to mid October, during strong or gale force NW sector winds, as follows: Nov. 28th 1980, Sept. 10th (3), 23rd and Oct. 20th 1984, Sept. 3rd 1986 and Aug. 21st 1988.

Storm Petrel *Hydrobates pelagicus*

Scarce and irregular, recorded in only 6 years, between July 5th and Oct. 17th. Usually with strong to gale force NW sector winds but 12 flew W in virtually calm weather on Sept. 16th 1987. Monthly totals were: July (4), August (0), September (21) and October (2).

Leach's Petrel *Oceanodroma leucorrhoa*

Recorded in only 9 years, though annually from 1984-90, and in highly variable numbers, typically between early September and early October; extreme dates were July 5th (1990) and Nov. 1st (1986). However, 86% of all birds appeared on just 3 dates, as follows: 32 on Sept. 13th 1988, 36 more the following day and 181 on Oct. 1st 1978, when 106 flew W at very close range in the first 2 hours after dawn. Doubtless others had passed in the night. Otherwise usually only 1-2 per season but occasionally up to 12 in a day. Almost all birds have coincided with NW sector gales or as winds veered northerly and began to moderate. Two birds occurred in NE-NNE winds.

Gannet *Morus bassanus* See top p.37.

Scaup *Aythya marila*

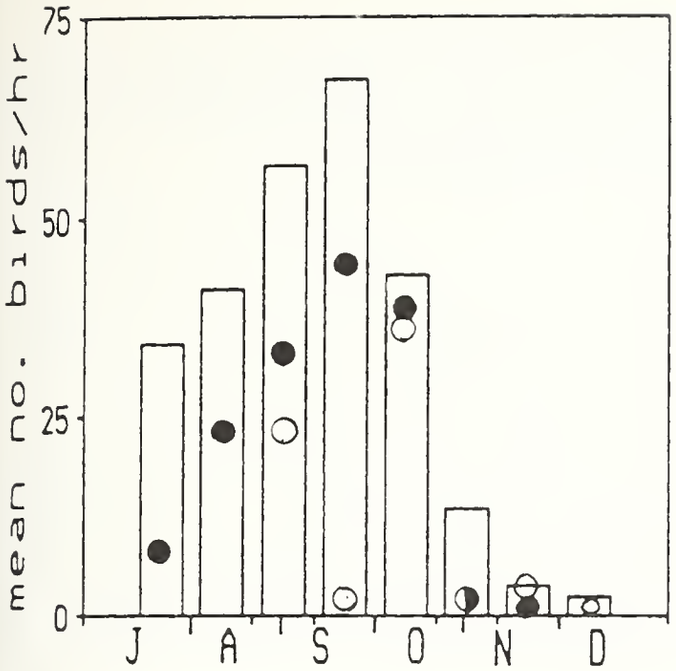
Scarce, with 9 records in 8 years totalling 21 birds, all flying W. Recorded only in October-November, usually in ones or twos but with 9 on Nov. 9th 1991.

Eider *Somateria mollissima*

Scarce, with 7 records in 6 years totalling 13 birds, of which 62% flew W. Extreme dates were Aug. 22nd and Nov. 25th and most (7) were seen in October.

Long-tailed Duck *Clangula hyemalis*

Very scarce, with 7 singles flying W between Oct. 7th and Dec. 4th.



Gannet *Morus bassanus*

Common, sometimes numerous, and present daily throughout the summer and autumn until late October, with small numbers during November/December. Passage peaks in September when the highest numbers occur during W and NW sector winds, with 1200-1300 birds on 4 occasions and 700-975 on another 4. Most pass before 11.00 hours (Figure 3) but big movements may straggle on into the evening. During offshore or light winds, particularly, small flocks often fish close inshore, sometimes with porpoises.

Common Scoter *Melanitta nigra*

An annual passage migrant in small numbers scattered throughout the season, though probably most frequent during July to September. Mean hourly passage rates were: July (8.9), August (3.5), September (7.1), October (2.9), November (2.5) and December (0.3). Normally only 100-400 recorded each autumn and 85% of birds flew W, in very small groups, under all wind conditions. An exceptional movement of 1130 W in 2¾ hours on Oct. 21st 1991 was followed by 312 W and 293 E on 23rd, when birds appeared to be searching for feeding grounds and were probably part of the large assemblage in Conwy Bay at that time.

Velvet Scoter *M. fusca*

Scarce with only 9 records in 7 years totalling 14 birds; 86% flew W, often with Common Scoters. Recorded only between Oct. 5th and Nov. 25th, with 79% of records in October.

Red-breasted Merganser *Mergus serrator*

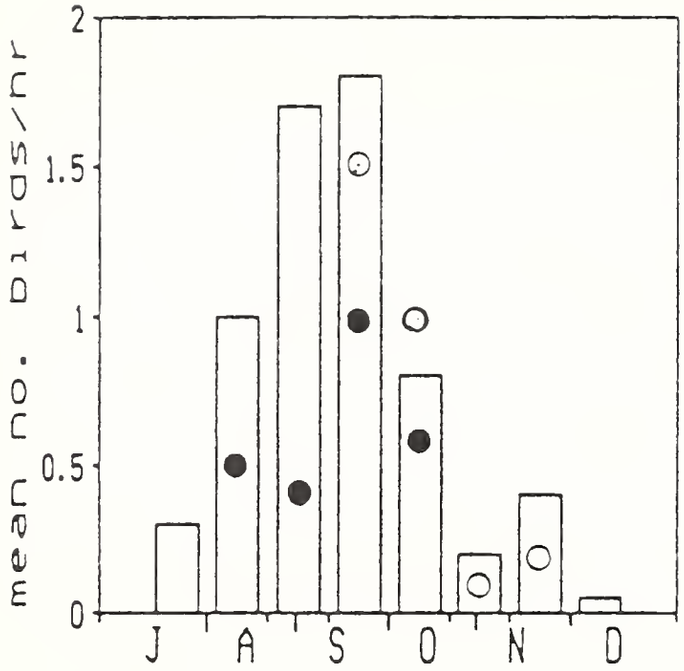
Uncommon but annual migrant, with 96% of birds moving W, mainly in October/November. Scarce in August and early September when most birds in the moult assembly in Conwy Bay are flightless. Records were distributed in August (0.8%), September (19.5%), October (37.6%), November (40.6%), December (2.3%).

Pomarine Skua *Stercorarius pomarinus*

Scarce but annual migrant forming 5% of all skuas identified; 13 in 1986 was the best year. Occurs mid August to mid November, with extreme dates of Aug. 8th (1986) and Nov. 28th (1980). Monthly totals were August (18), September (34), October (26) and November (15). Of 54 birds aged, 54% were adults, 5% sub-adults and 41% immatures; adults predominated (67% of records) in August/September, immatures (62%) thereafter. Although 60% of birds appeared in strong to gale force NW sector winds, 34% occurred in light breezes or near calm and offshore winds, when some flew high and close inshore. The coincidence of 11 birds with NE winds and 5 with SE suggested possible overland migration from the North Sea. Of 28 birds seen by PJD 21% attacked Kittiwakes (3) or Herring Gulls (3).

Arctic Skua *S. parasiticus* Figure top p.38

Annual from August to early November, with at least 125 birds in some years and comprising 57% of skuas identified. Extreme dates were July 30th and Dec. 6th and monthly totals were July (2), August (240), September (617), October (251), November (59) and December (2). Passage peaked through September, with the largest numbers during strong to gale force NW sector winds, though many appeared in NE and SW sector winds, with mean passage rates of 3.7 birds/hour in offshore winds. On 6 mornings 30-39 birds occurred, with once a loose flock of 13. Some appear at any time of day, or with light offshore winds and a few have overflown the Point in such conditions. Good movements sometimes coincided with major passage by terns and Kittiwakes but there were too many days when the reverse applied for any correlation to be established. Of 414 skuas observed by PJD,

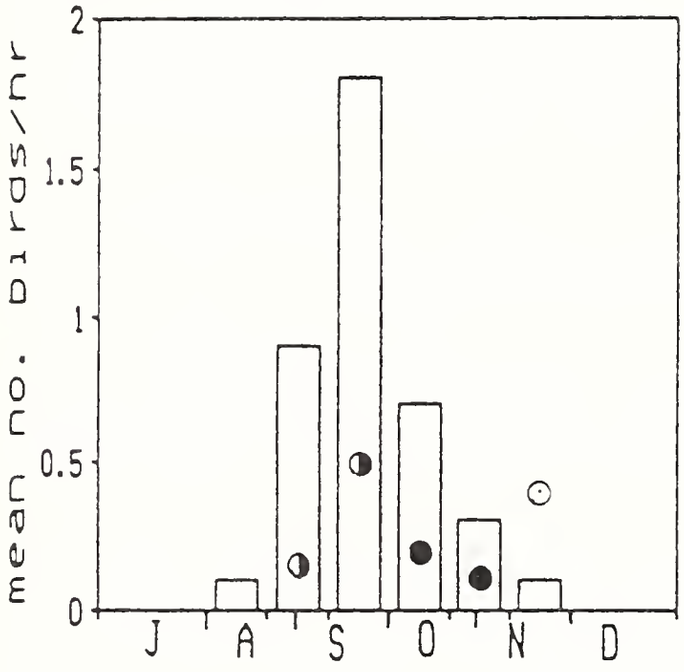


Arctic Skua *(continued)*

11% launched attacks on Kittiwakes (37), 'commic' terns (5) and Sandwich Terns (4); 2 others chased immature Pomarine Skuas.

Long-tailed Skua *S. longicaudus*

An immature W on Sept. 13th 1988, wind NNW6 (TJ), an adult W close inshore in the evening of July 31st 1989, wind NW3-4 (BI) and 2 juveniles together W very close in the afternoon of Sept. 3rd 1992, wind NW3-4 (BI).



Great Skua *S. skua*

Annual from mid August into November, with over 100 birds in good years and comprising 35% of identified skuas. Extreme dates were July 27th and Nov. 26th, although a very distant skua on Dec. 9th 1984 may have been this species. Monthly totals were July (1), August (84), September (435), October (172) and November (25). Passage peaks in September, a little later than that of Arctic Skua, and most occur in strong to gale force NW sector winds. The most notable counts were 78 in 8 hours on Sept. 30th 1978 (including 39 in an hour and a party of 9) and 58 in 6½ hours on Sept. 10th 1984; 11-26 birds have been noted on 9 other dates. Several overflew the Point in light breezes. Of 286 Bonxies seen by PJD, 9 (3%) attacked Gannets (4), Kittiwakes (3) and Herring Gulls (2), whilst DW saw one harassing Manx Shearwaters.

Mediterranean Gull *Larus melanocephalus*

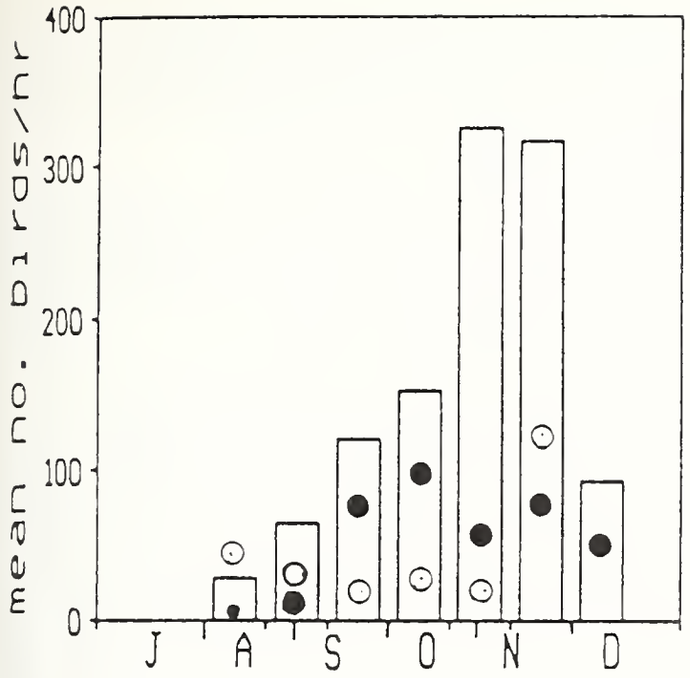
Four single adults close inshore during NW winds on Aug. 20th 1981 (EISR), Nov. 27th 1985 (DCT), Sept. 16th 1987 (DCT) and Oct. 7th 1990 (DCT, BI).

Little Gull *L. minutus*

Surprisingly scarce but probably annual, although fewer than 5 per year except for 14 in 1989. Extreme dates were July 31st and Nov. 14th and monthly totals July (8), August (4), September (9), October (12) and November (8). Mainly seen in early mornings with Kittiwakes during NW sector winds, but several were seen in light SW and NNE winds and 8 passed in one evening movement.

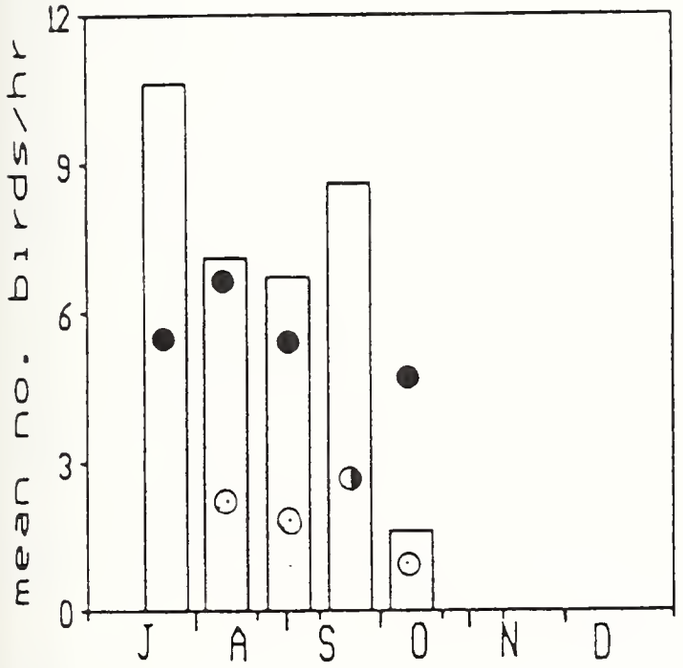
Sabine's Gull *L. sabini*

Rare, with records from 8 years, usually singles but 4 in 1988. Extreme dates were Aug. 25th (1982) and Dec. 6th (1988) and monthly totals were August (1), September (12), October (2), November (1) and December (1). Of the 17 birds, 6 were adults and 11 juveniles. Most were with Kittiwakes fairly close in during fresh to gale force NW sector winds but 3 appeared in light or moderate W and SW winds.



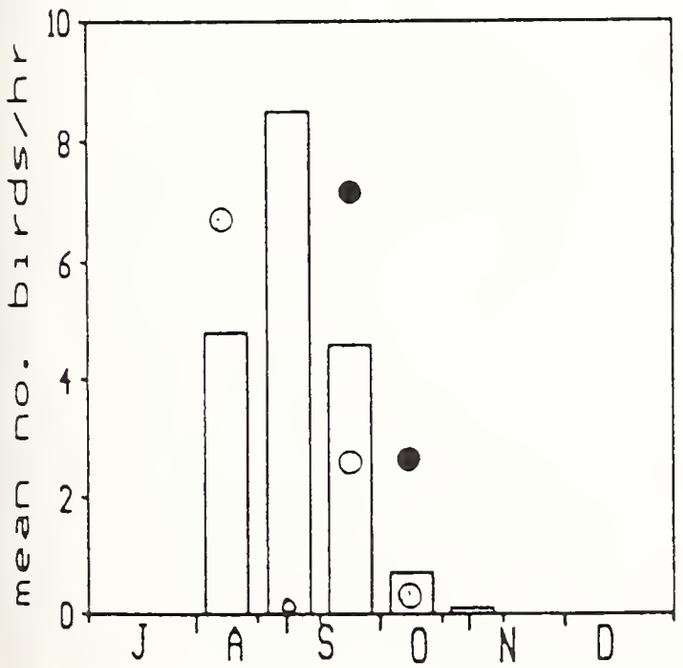
Kittiwake *Rissa tridactyla*

Common throughout the summer and autumn, with very large movements each October and November during or immediately after strong to gale force NW sector winds. A massive exodus sometimes happens at first light out of Moelfre and Red Wharf Bays (Figure 4), *eg* 6200 in 3 hours (3000 in one) on Nov. 26th 1984 and at least 4500 in 4½ hours on Oct. 21st. There were also 4 movements of 3-4000 birds and 8 of 2-3000. During SW winds a procession of small flocks may feed en route well off shore as they fly diagonally into wind across Liverpool Bay. Passage is much reduced after mid morning (Figure 4).



Sandwich Tern *Sterna sandvicensis*

Common, although surprisingly few relative to the 7300 pairs breeding around the north Irish Sea (Lloyd *et al* 1991), and no more than 560 recorded in an autumn. Main passage was from late July to mid September, with a few into early October; the latest records were Nov. 4th (1989) and 17th (1982). Westerly movements of 100-300 birds, spread throughout the day, have occurred with fresh or strong NW sector winds.



Common/Arctic ('Commic') Terns
S. hirundo/paradisea

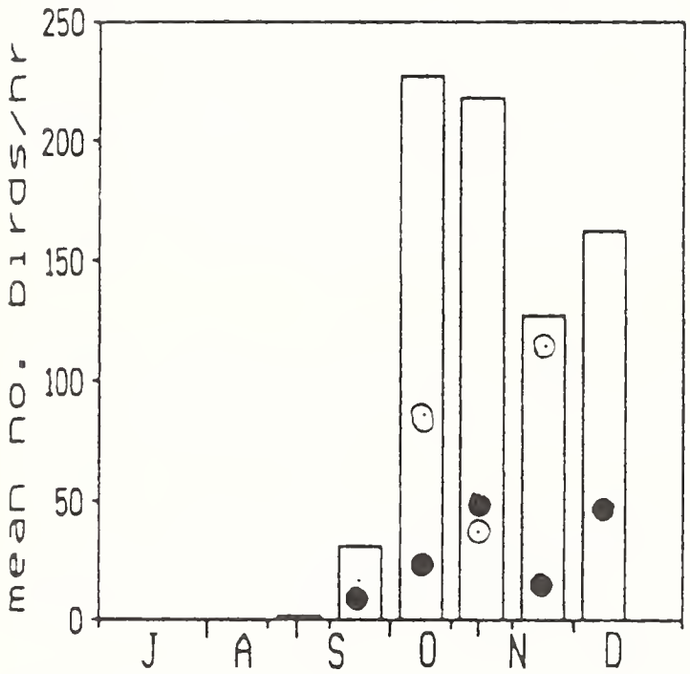
Common, although fewer than expected from the large breeding populations in the north Irish Sea and W. Scotland. Main passage from early August to mid September, with a few into mid October; the latest was on Nov. 4th (1991). Unlike other species at Point Lynas, the largest movements occurred with light to moderate SW winds, with mean passage rates of 18-23 birds/hour. The Arctic Tern has not been identified but doubtless occurs.

Little Tern *S. albifrons*

Rare, with fewer records than Black Tern or Sabine's Gull, although breeding around Liverpool Bay. Most have occurred in late August and early September, 12 of the total of 17 with strong to gale force NW winds. Extreme dates were July 31st and Oct. 9th.

Black Tern *Chlidonias niger*

Scarce and erratic, recorded in 8 years and with up to 7 birds in an autumn. Extreme dates were July 30th and Sept. 28th. Most (69%) were in early September, often during good *Sterna* tern movements in moderate to strong W and SW sector winds; otherwise seen in NW winds, often strong or gale.



Guillemot/Razorbill *Uria aalge/Alca torda*

Common, at times abundant, although very few in July or August, when postbreeding birds in the Irish Sea are in flightless moult (E.I. S. Rees, *pers. comm.*). Very large movements occurred in October and November, typically with strong to gale force W and NW sector winds. Small movements also occurred in other conditions. The largest movements were of 6450 birds in 6½ hours on Oct. 15th 1992 and 3 other movements of 3-4000 birds. Highest passage rates were in the first 2 hours after sunrise (Figure 4) but some birds still passed in late afternoon on busy days. Small numbers, including parents and juveniles, feed regularly off the Point, especially in offshore winds.

Black Guillemot *Cepphus grylle*

Scarce although breeding and resident on Anglesey's N and NE coasts. The 13 sightings were spread between July 31st and Nov. 24th and appeared to represent random movements of the local population.

Little Auk *Alle alle*

Two flew W on Nov. 9th 1991, wind WNW4-5 (DW, SHR). One in winter, flying W on Jan. 7th 1988, wind NW7 (DCT).

Puffin *Fratercula arctica*

Only 3 records, although some were possibly missed during large auk movements, as follows: singles E on Oct. 28th 1981, wind SW3-4 (DCT, NB), W on Nov. 11th 1985, wind NW4-5 (DCT) and W on July 9th 1990, wind W5-6 (DCT), perhaps from the small Puffin Island colony.

DISCUSSION

The Point Lynas observations amassed over 18 years confirm the earlier predictions (Eades 1966, Gibbs 1969) that large numbers of seabirds should be observable flying west past this headland in autumn. Indeed, Point Lynas almost certainly is the premier site for autumn seawatching not only in north Wales but also in the north-eastern Irish Sea. The data also confirm that the biggest and most diverse movements occurred after strong or gale NW sector winds had blown birds deep into Liverpool Bay during the night. Some of the most notable movements are listed in Table 3. However, some passage was visible on most other days irrespective of wind direction and speed. At Bardsey, the most productive winds for seawatching vary between SW and NW (Jones & Rowley 1981). This difference presumably reflects Bardsey's more southerly aspect and 'catchment area'.

At Point Lynas many species showed a marked diurnal pattern to their movements, with maximum passage rates occurring within the first few hours after dawn, and then

Table 3. Notable westerly movements of divers and seabirds at Point Lynas, Anglesey, in autumn during 1976-1993.

Species	*Aug. 30 1982 wind NW7 1415-1915*	*Sept. 10 1984 wind WNW7-5 0650-1320*	*Sept. 13 1988 wind NNW7-5 0715-1430*	*Sept. 23 1984 wind NNW6-7 0645-1000*	*Sept. 30 1978 wind WNW8 0700-1500*	*Oct. 1 1978 wind N4-5 0700-1300*
Red-throated Diver	—	13	5	5	16	3
Great Northern Diver	—	—	1	1	2	4
Fulmar	356	294	300+	23	52	3
Great Shearwater	1	—	—	—	—	—
Sooty Shearwater	2	9	2	1	—	—
Manx Shearwater	219	53	3000+	12	44	5
Mediterranean Shearwater	—	3	—	1	—	—
Storm Petrel	—	2	1	—	—	—
Leach's Petrel	—	—	32	2	8	181
Gannet	460	975	1200	646	465	55
Pomarine Skua	—	—	2	1	—	—
Arctic Skua	8	39	31	24	26	10
Long-tailed Skua	—	—	1	—	—	—
Great Skua	8	58	23	14	78	13
Little Gull	—	—	—	1	—	—
Sabine's Gull	—	—	2	1	—	—
Kittiwake	306	680	1500+	1120	113	1765
Sandwich Tern	—	100	300+	34	24	18
'Comic Terns'	45	24	200++	17	10	1
Black Tern	—	—	3	—	—	—
Guillemot/ Razorbill	2	51	—	152	288	96

Notes: A dash indicates not recorded. All times are BST.

usually very few birds thereafter. A similar pattern is found at Bardsey (Jones & Rowley 1981) and at major seawatching sites in south-west England and in East Anglia (Dare, unpublished data). Evidently, at night in rough weather many seabirds may become disoriented and liable to be drifted, or blown involuntarily, close to a lee-shore. The observed early morning movements are thus a re-orientation as birds 'escape' back to the open sea, especially from large embayments. The subsequent diminution in passage intensity through the day, even when strong onshore winds continue, suggests that those birds which are yet well offshore at dawn can adjust quickly and thus avoid coming within visible range. The extent to which species other than nocturnal tubenoses normally fly at night is not determined, but the arrival of so many pelagic seabirds close to a leeshore by dawn could happen only if they were flying in the dark.

Seabird numbers and species diversity at Point Lynas during a given passage theoretically should be related to weather conditions during the preceding hours or days as well as to conditions at the time and, of course, the stage in the various migration schedules. Detailed analyses of synoptic weather charts could indicate likely origins and routes taken by seabirds, more especially for the rarer species. Such analyses were not attempted for Lynas data, however, for two reasons: (a) the Irish Sea is small, nearly enclosed and of complex shape; (b) lack of adequate and synchronous bird data from other sites in this region. Nonetheless, the accumulated Lynas records provide some idea of the nature of autumn seabird movements through the Irish Sea.

The occurrence of small westerly passages at Point Lynas during SW and easterly offshore winds show that some species — notably Gannet, Kittiwake, terns and auks — may be moving south down the east side of the Irish Sea on many days during their individual

migration seasons. For these common species, seasonal occurrence patterns are affected little by wind direction *per se* whereas (see later) their abundance can be influenced dramatically by certain combinations of wind direction and speed.

Such birds presumably have entered through the narrow (35 km) North Channel and could be part of a broad-front or diffuse southerly movement. Many individuals forage en route past Point Lynas under these conditions. Doubtless, in view of this restricted northern entrance, the vast majority of seabirds, and especially the more oceanic petrels, shearwaters and skuas, normally pass south to the west of Ireland. There, recent watching has confirmed the magnitude and diversity of the autumn passage (*Irish Bird Reports*, *Birding World* news items).

In contrast, Manx Shearwater and Guillemot, in particular, feed in the northern Irish Sea in large numbers during late summer and autumn, as revealed by ship-borne surveys (Webb *et al.* 1990). The shearwaters concentrate in July-August along a frontal zone of high productivity south-west of the Isle of Man (Rees & Jones 1982). Some birds returning south to their colonies on Bardsey and the Pembrokeshire islands at times are deflected into Liverpool Bay by westerly winds, and may then return past Point Lynas (and west Anglesey headlands) in considerable flocks during late afternoon and early evening. Numerous Guillemots form a semi-resident population between the Irish coast and Liverpool Bay through summer and autumn, and this moves about in response to changing winds (E.I.S. Rees, pers. comm., Jones & Rowley 1981). Razorbills, on the other hand, appear to be much less common and, thus probably comprise only a small fraction of the auks observed at Point Lynas.

All these 'routine' patterns would be disrupted by the onset of gales from between SW and NW, particularly when winds veer NW following a SW 'blow' — the classic sequence as a typical Atlantic depression tracks quickly east to the north of Scotland. Two effects may then happen. Firstly, many birds flying south down the Irish Sea may be deflected east of the Isle of Man and Anglesey. Secondly, many extra birds, including rarer species, may be diverted from their Atlantic routes into the Irish Sea through its North Channel, more especially as veering winds push them towards the coasts of Northern Ireland and south-west Scotland. From a general inspection of synoptic weather charts the most notable seabird passages at Point Lynas (Table 3) could best be explained by North Channel incursions rather than by southerly origins via St. George's Channel. Conceivably, others might be driven up from the Celtic Sea by the initial SW gale, as appears to happen at Bardsey (Jones & Rowley 1981) and at Strumble Head in south-west Wales. Ultimately, the wind veering NW in the north Irish Sea would then steer birds into Liverpool Bay. It would require watches synchronised throughout the Irish Sea before storm-driven and other movements could be described fully.

The possibility that some skuas could have come overland from the North Sea is suggested by the appearances of Arctic and Pomarine Skuas at Point Lynas on several occasions during SE-NE winds, and by recent evidence from southern Scotland and northern England. Thus, from the Firth of Forth each autumn significant numbers of Pomarine and Long-tailed Skuas, plus some Arctic and Great Skuas, fly inland — presumably taking a short-cut to the west coast (*Scottish Birds*, 1990-94). Of greater import, however, is the mounting evidence for trans-Pennine flights from the Yorkshire coast directly into Liverpool Bay. During the autumns of 1985-90 there were 57 records of skuas (91 birds) at 33 sites far inland including many Pennine reservoirs in addition to waters nearer the Humber Estuary, from the head of which Arctic Skuas have been seen departing westwards (*Yorkshire Bird Reports*). These inland sightings involved 41 Arctic, 35 Pomarine, 15 Great, and 10 Long-tailed Skuas, including small parties of up to 9 birds. Some skuas were flying, other were resting. Where flight directions were reported (14

records), 72% were heading SW-NW, 14% south and 14% E-SE. In Cumbria, also, Arctic Skuas have been observed flying west across the fells in autumn (2 records in *Cumbrian Bird Reports*, 1988-94). The comparative scarcity of inland records in Cumbria could result from low observer coverage, or it may reflect the absence of a large estuary in Northumberland to 'lead' birds inland in autumn. By contrast, there are strong spring passages of (especially) Pomarine Skuas eastwards from the inner Solway Firth to the North Sea (*Cumbria Bird Reports*). These recent findings should stimulate more intensive watching at Point Lynas during E-NE winds, and also later in the day, than has been the practice hitherto.

The relative scarcity at Lynas of terns (*Sterna* spp.) and Leach's Petrels is puzzling compared to the numbers found further east in Liverpool Bay. Of the many Common and Sandwich Terns that frequent the Dee Estuary to Conwy Bay sector in late summer and early autumn, most would appear to depart by the short route through the Menai Strait (Gibbs 1969, E. I. S. Rees, pers. comm.). Leach's Petrels occur off the Wirral coast and Hilbre Island in most autumns, sometimes in hundreds, following NW gales. However, at Point Lynas — and despite extra vigilance at such times — few petrels have been seen except on 1 October 1978 when 181 flew west very close inshore. This disparity could arise if most birds were able to return offshore as soon as winds started to moderate; in which case they would be well out of observers' range by the time they reached Point Lynas. Further, some petrels must pass at night, as on 1 October 1978 when birds were moving already in numbers at first light.

The passage of divers and sea-ducks at Point Lynas was generally very light and also mainly westerly (93% of divers, 85% of ducks) irrespective of weather conditions. These species presumably were en route to wintering sites off west Wales and, perhaps, Ireland; whilst east-flying birds probably represented local movements between bays along the north Wales coast itself.

This assessment of the Point Lynas data shows clearly that Irish Sea seabird movements in autumn, and the weather factors that in part generate and steer them, are complex and merit further study. Ideally, a coordinated programme of systematic and synchronised recording, under all weather conditions, should be established. The observations from a network of seawatch stations on both sides of the Irish Sea could then be correlated with meteorological information.

ACKNOWLEDGEMENTS

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THE DECLINE OF THE RING OUZEL *Turdus torquatus* BREEDING POPULATION IN GLAMORGAN (v.c.41)

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SUMMARY

Recently published Ring Ouzel breeding population estimates, combined with a dearth of recent breeding records in Glamorgan, identified the need to clarify the status of the species in the county. A desk study revealed that Ring Ouzels were recorded at 22 breeding sites in Glamorgan over the period from 1961 to 1994, with a combined total of 14 pairs present on 2 escarpments in 1965. Breeding activity was noted at 18 of these sites over the period from 1980 to 1987. Despite this, the species was recorded in only 8 tetrads during the course of the Glamorgan breeding atlas surveys, which were conducted from 1984 to 1989, with no pairs confirmed as breeding. All known post-1980 breeding sites in Glamorgan were visited on at least 2 occasions during June 1995, resulting in 2 confirmed breeding records, 3 probable breeding records and one possible breeding record. The distribution of the breeding pairs in 1995 suggested a significant shift away from the former breeding stronghold in the north of the county, and the two escarpments which supported 14 pairs in 1965 were no longer occupied. Historically, prior to 1960, the Ring Ouzel was believed to be a scarce and local breeding species in Glamorgan, and the unprecedented numbers recorded breeding in the county from 1961 to 1985 correlate strongly with a period when the Peregrine breeding population in Glamorgan was at its lowest level since records began. Peregrines ceased to breed in Glamorgan in 1961 and did not resume breeding until 1975, with the subsequent recovery not gathering any real momentum until the mid 1980s, which corresponds with the recent decline of the Ring Ouzel in the county. These data imply that the Ring Ouzel breeding population level over the period from 1960 to 1985 was artificially high as a result of unusually low predation, and that breeding population estimates based on data collected during that time are likely to provide a poor indication of the situation in the mid 1990s.

INTRODUCTION

As far as can be ascertained from the local ornithological archive, the Ring Ouzel *Turdus torquatus* has never been a particularly common breeding species in Glamorgan.

This is principally due to the limited area of optimum breeding habitat in the county. The earliest records were documented by Lucas (1802), when the species was listed in the *Swansea Guide*, and by Dillwyn (1848), when it was said to breed in the "rocky mountains" at the head of both the Neath and Swansea valleys. A later assessment of the Ring Ouzel's breeding status in the county appeared in the *Transactions of the Cardiff Naturalists' Society* in 1900, when the species was considered to be a local summer visitor with up to 5 pairs said to breed on occasions, mostly at the head of the Rhondda valley. There were few subsequent records of breeding in the county until pairs were seen in 1952 and 1959. Thereafter, numbers were seen to increase. An escarpment in the north-west of the county which held a single pair in 1961 hosted 7 pairs in 1963, while a second escarpment, some 6 miles away from the first, was found to host breeding pairs in 1964. By 1965, a combined total of 14 pairs was thought to be breeding at these 2 localities.

Although breeding records were fairly sporadic over the ensuing period to the mid 1980s, the indications were that the Ring Ouzel was a fairly widespread, if thinly scattered, breeding species in the county at that time, Pairs still nested along the escarpments in north-west Glamorgan, and pairs were also reported as having bred at some 16 other sites in the north of the county during the period from 1980 to 1987.

Despite this, the Glamorgan breeding atlas surveys Thomas (1992) and Hurford & Landsdown (1995), conducted over a 6 year period from 1984 to 1989, failed to confirm breeding in the county, with only 2 tetrads supporting pairs which were probably breeding and 6 where pairs possibly bred. Thereafter to 1992, the only reports of breeding were of single pairs in the Blaenrhondda and Mynydd Ystradffernal areas in 1990. In 1994, however, Lovegrove *et al.* (1994) estimated the Ring Ouzel population in Glamorgan at 12-14 pairs, while Green & Tyler (1994) estimated the 1988 population at 20-30 pairs. The dearth of recent records, combined with the population estimates published in 1994, identified the need to determine the true status of the species in Glamorgan, and resulted in a survey of breeding Ring Ouzels in the county in June 1995.

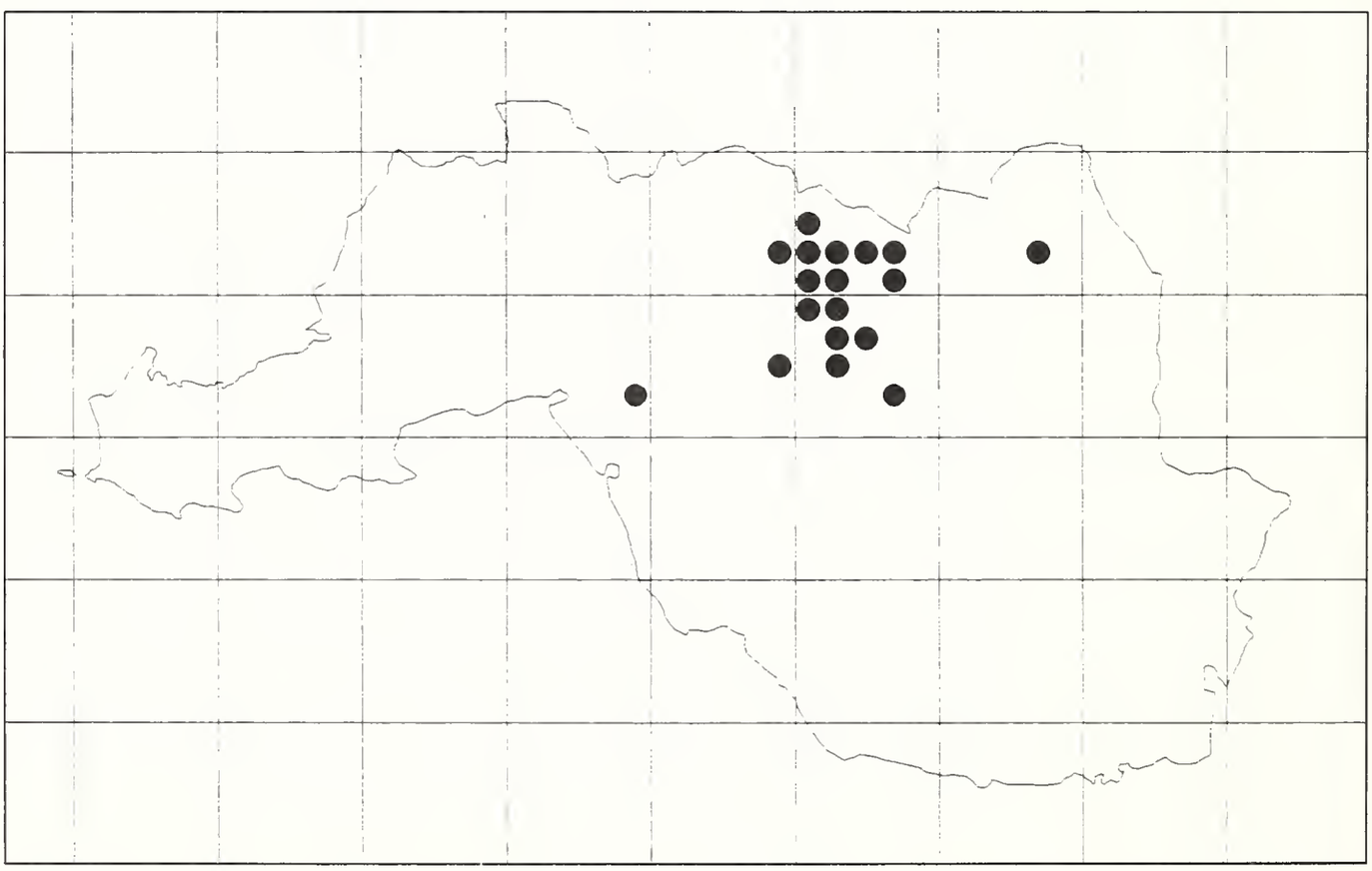

Figure 1. The tetrad distribution of Ring Ouzel sites occupied in the period from 1980 to 1994 and surveyed in June 1995.

METHODS

In the first instance, a desk study was undertaken to establish the grid references of all Glamorgan sites known to have held breeding Ring Ouzels since 1980. This resulted in a total of 22 sites, distributed over an area of 18 tetrads (Figure 1). These sites were then allocated to a small volunteer workforce for survey. Given that passage birds have often been recorded moving through the valleys in April and May, each of these sites was visited during June 1995, a time of year when the possibility of sightings relating to new arrivals or returning birds was at its lowest and when breeding adults should have been feeding young. The majority of sites were visited at least twice, while several others were visited on up to 4 occasions. Breeding evidence was noted using the **Confirmed**, **Probable** and **Possible** criteria utilised during the 1980s tetrad surveys, with these data being supplemented by counts of the number of pairs. Observers were also requested to record breeding evidence of Peregrines at each site and make note of the main habitat types present.

RESULTS

The 1995 survey confirmed that Ring Ouzels were breeding in 2 tetrads, with probable breeding recorded in 3 tetrads and possible breeding in one tetrad (Figure 2). No more than one site was occupied in any one tetrad, and no more than a single pair was found at any one site. Each of the localities supporting breeding Ring Ouzels in 1995 was situated at an altitude in the 400-500 metre range, with either Pennant Sandstone or Millstone Grit outcropping.

Table 1. The occurrence of habitat types at current and former Ring Ouzel breeding sites in Glamorgan.

Habitat type	*Occurrence at current sites (n=6)*	*Occurrence at all known sites (n=22)*
Crags/screes	6 (100%)	17 (77%)
Rock outcrops	2 (33%)	5 (23%)
Salix/Sorbus trees	3 (50%)	8 (36%)
Vaccinium patches	1 (17%)	4 (18%)
Vaccinium moor	0	1 (5%)
Conifer plantation	2 (33%)	8 (36%)
Molinia moor	4 (67%)	10 (45%)
Calluna moor	0	1 (5%)
Calluna (patchy)	1 (17%)	3 (14%)
Coal spoil	2 (33%)	2 (9%)
Bracken	2 (33%)	7 (32%)
Scrub	1 (17%)	2 (9%)

Of the 22 sites surveyed, all but 2 appeared to support at least marginal Ring Ouzel breeding habitat, with cliffs, crags, scree or rock outrcops recorded at all sites, and scattered *Sorbus* and *Salix* trees, rough *Molinia* pastures, bracken *Pteridium aquilinum* and conifer plantations all noted frequently (Table 1). Some sites were small, however, and encroaching conifer forest appeared to be a potential problem at several sites, though one pair was probably using the habitat for breeding. Very little heather *Calluna vulgaris* or bilberry *Vaccinium myrtillus* was noted, though both were patchily distributed at a few sites and probably overlooked at others. Perhaps significantly, the favoured feeding habitats of *Calluna/Vaccinium* moor and closely-cropped pasture were rarely noted, though the latter is probably present to some extent at most sites.

Peregrines *Falco peregrinus* were confirmed as breeding at 7 of the sites (32%), including 2 current Ring Ouzel breeding localities, and a pair of Peregrines was present, but not thought to be breeding, at one other.

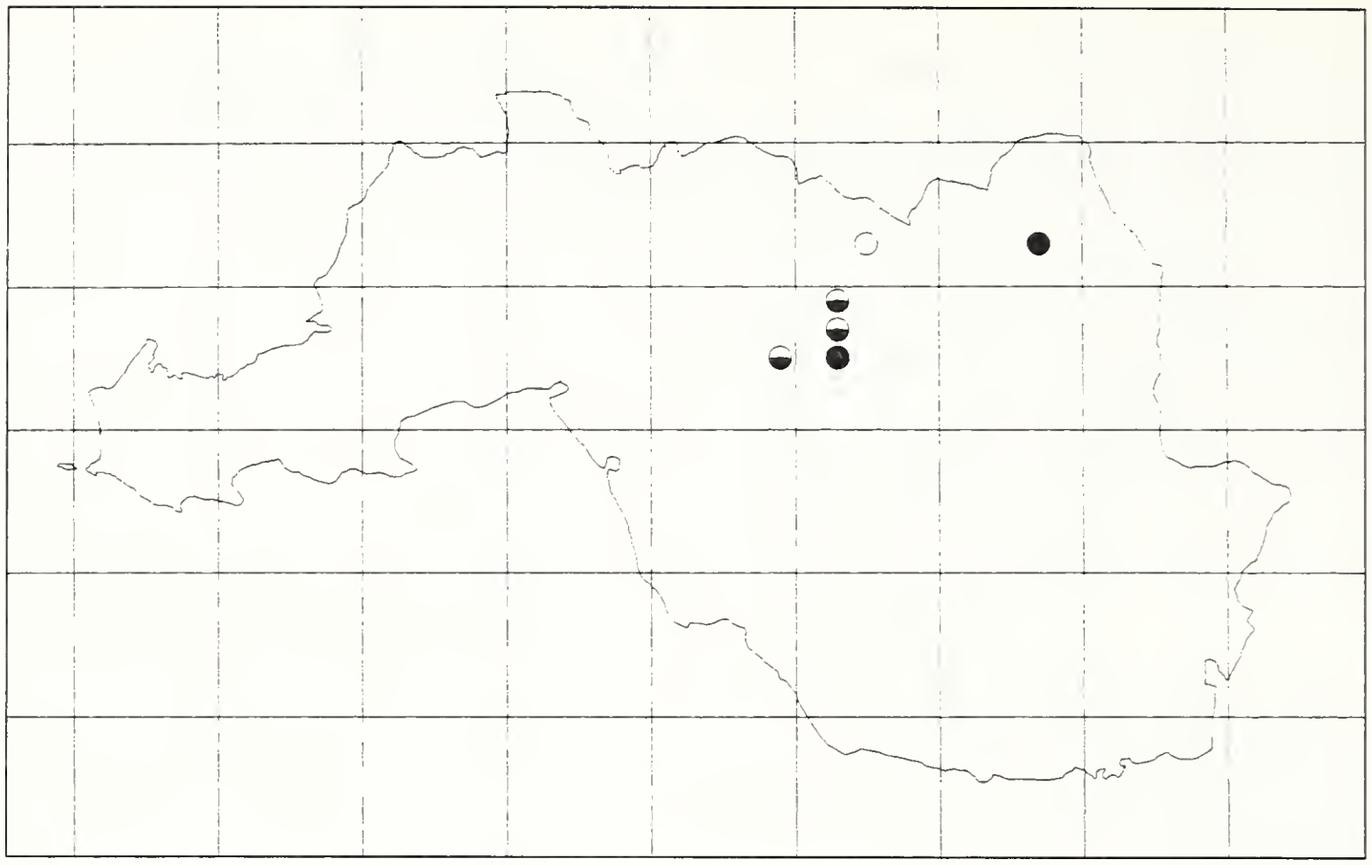

Figure 2. The tetrad distribution of Ring Ouzels in Glamorgan in 1995, all other tetrads marked on Figure 1 were untenanted. (**Key** - solid black circles = Confirmed breeding, black and white circles = Probable breeding, open circles = Possible breeding).

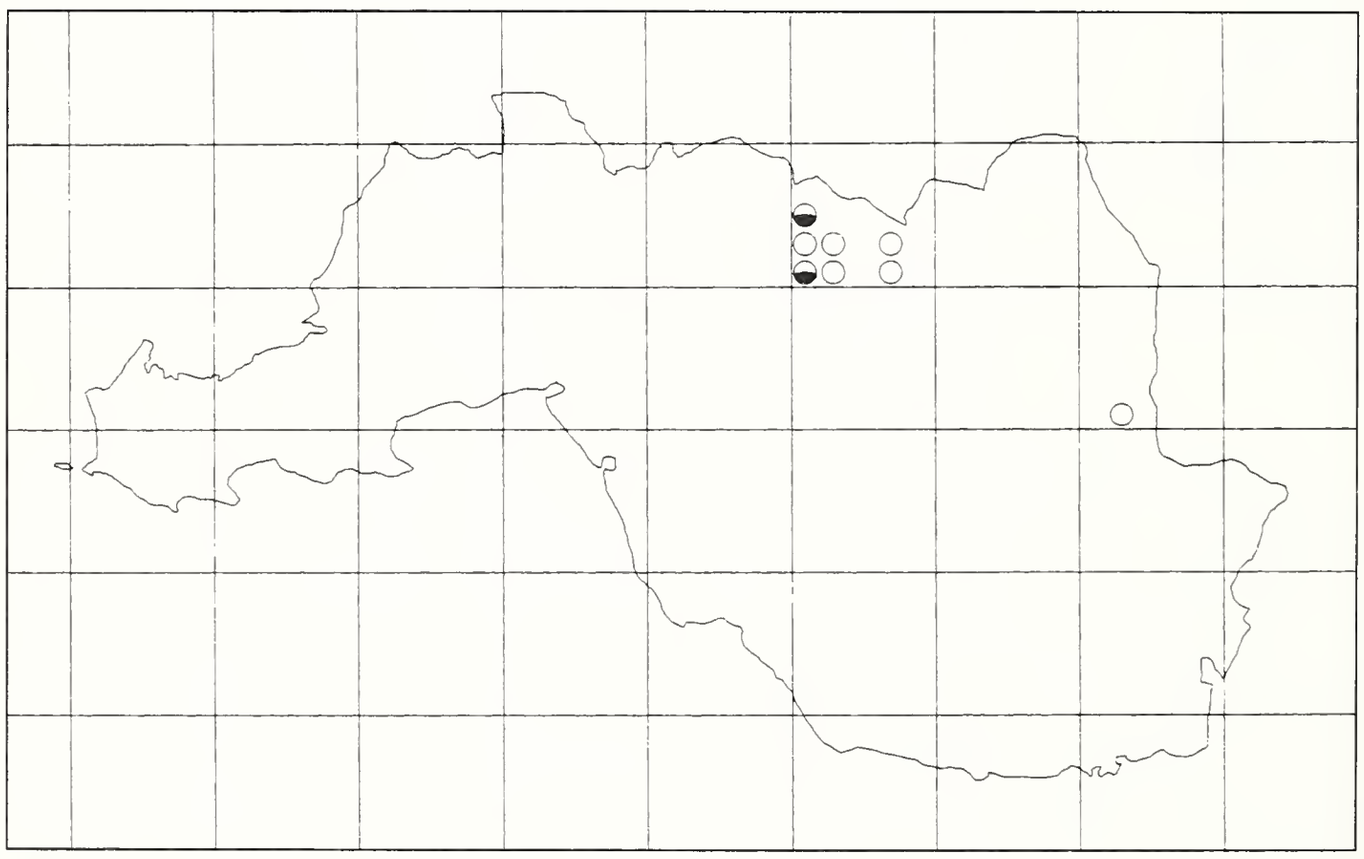

Figure 3. The tetrad distribution of Ring Ouzels in Glamorgan during the 1980s Breeding Atlas surveys.

DISCUSSION

Direct comparison with the 1980s breeding atlas (Figure 3) would not be sound, as the time spent searching for Ring Ouzels in 1995 was probably disproportionately more than that spent during the years of the 1980s Breeding Atlas surveys, when the field workers were recording all species. However, given that any imbalance in recording effort would almost certainly be skewed in favour of the 1995 survey, it would seem reasonable to suggest that the 1995 results indicate a significant shift away from the 1965-1989 stronghold in the extreme north of the county. It would also be fair to suggest that the Glamorgan Ring Ouzel population has undergone a steep decline since the heady days of the mid-late 1960s to early 1980s. Neither of the escarpments which supported a combined total of 14 pairs in 1965 were found to be tenanted by Ring Ouzels, despite a total of 9 man days being spent surveying the 2 sites. Elsewhere, only 6 of the 20 sites known to have supported Ring Ouzels since 1980 were still occupied. The total Glamorgan breeding population in 1995 was estimated at only 5 or 6 pairs.

Although undocumented, probably due to poor observer coverage, habitat loss or degradation would almost certainly have resulted in a decline in the local Ring Ouzel population during the late 19th century, particularly at the head of the Neath and Swansea valleys. This factor, however, is less likely to have played a major role in the decline since the mid 1980s. The main thrust of industrialisation in the Glamorgan valleys occurred during the 19th century, and there is no evidence to suggest that any Ring Ouzel sites have been lost to development in the past 15 years. The vast majority of the heather moors in the county had already been lost by the mid 1920s, and have never been recovered. The same period saw the afforestation of the upland areas gather momentum and, while plantations were noted in the vicinity of several sites, in only 2 cases were the sites deemed to be totally unsuitable as a result. The uplands of Glamorgan appear to have changed little, in fact, during the period of the recent Ring Ouzel decline.

While it is likely that the Ring Ouzel was more numerous in Glamorgan in the 1800s, historical evidence suggests that it was a scarce and local breeding species in the county throughout the 1900s until c. 1960. This should not be too hard to believe. Only a small area of land rises above 600 metres, and this is generally dominated by rough, species-poor, *Molinia* pastures and conifer plantations, which falls well short of the preferred breeding habitat of the species. The discovery of 14 pairs in 1965 was both unprecedented and unexpected. Until recently, this apparent increase in numbers was thought to be related to under-recording in the north of the county prior to that time. Given the relatively high level of interest at Peregrine sites in the 1950s, however, this probably does an injustice to the earlier naturalists who were active in the county. Recent evidence suggests that it was no coincidence that the increase in Ring Ouzel numbers occurred at a time when the local Peregrine population was at its weakest since records began and when no eyries were tenanted in the county: Peregrines ceased to breed in Glamorgan in 1961 and did not resume breeding until 1975. At the end of the 1970s, the county still held only one pair of breeding Peregrines, and it was not until the mid to late 1980s that the subsequent recovery of the local Peregrine population gained any real momentum, which correlates strongly with the relatively recent, if marked, decline in the Ring Ouzel population (Figure 4).

It is likely that Ring Ouzels increased throughout Wales during the period when Peregrine numbers were depleted by the side-effects of pesticides, and it is possible that overspill from bordering counties contributed to the increased numbers seen in the extreme north of Glamorgan during the 1960s and 1970s. Since that time, however, the majority of sites in the extreme north of the county have been vacated by the species, and almost a third of the sites occupied by Ring Ouzels in Glamorgan from 1980 to 1994 have been re-occupied by Peregrines.

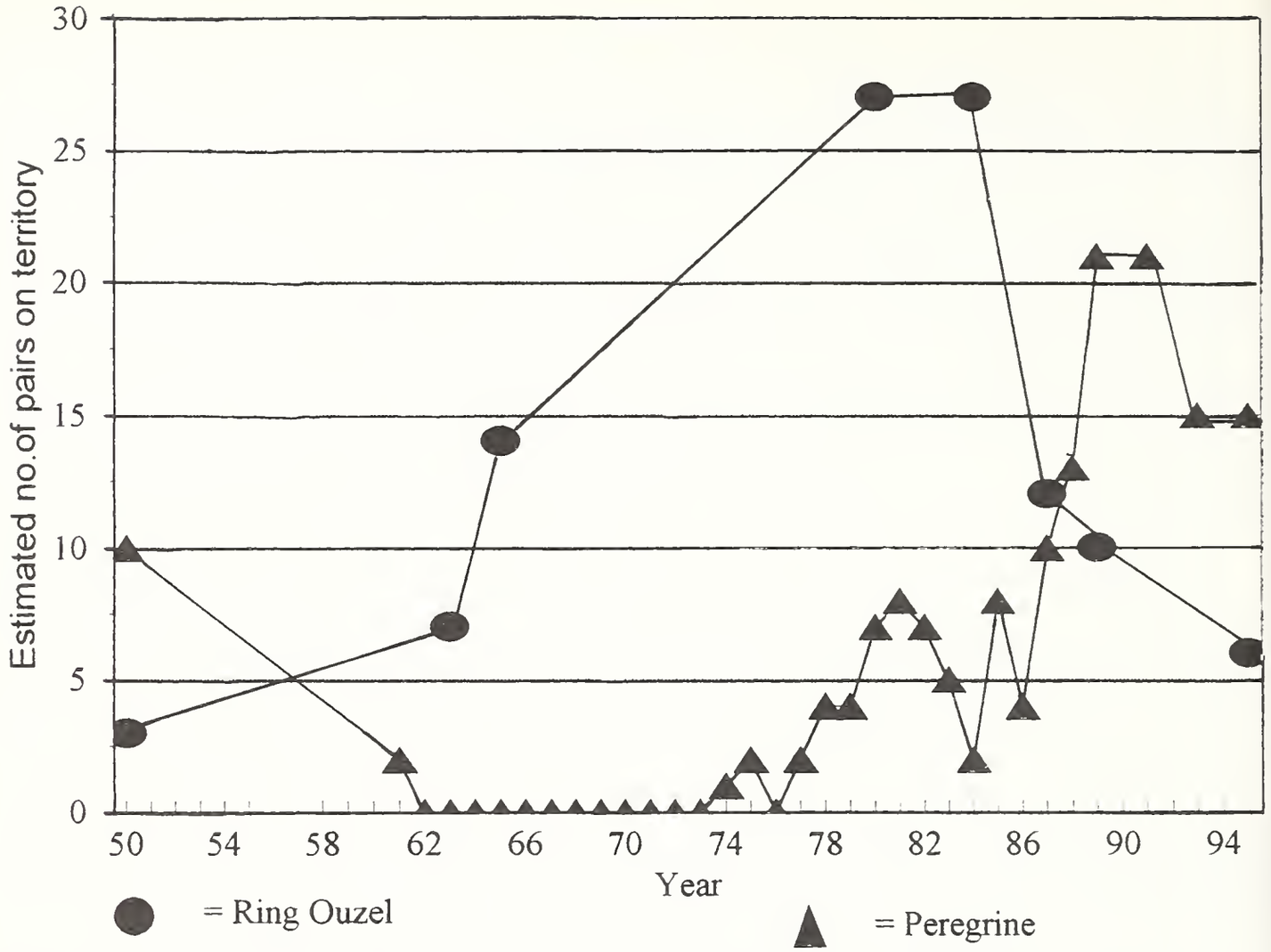

Figure 4. Ring Ouzel and Peregrine breeding population estimates in Glamorgan over the period from 1950-1995 (based on available data).

Elsewhere in Wales, recent research conducted by the RSPB has shown similar declines in the Ring Ouzel population since the late 1970s, most notably at Mynydd Rhiwabon where 19 pairs in 1981 had declined to only one pair in 1995, and at Elenydd where 13 pairs in 1975 had declined to 6 pairs in 1995 (I. Williams, *pers. comm.*). It is possible, of course, that several factors have contributed to the recent decline of the Ring Ouzel in these areas, including the degradation of optimum breeding habitats in Wales, and a loss of feeding habitat in the species' wintering quarters in Morocco. The Glamorgan results, however, suggest that the fortunes of the Ring Ouzel are inversely correlated with those of the Peregrine and that, while the Ring Ouzel forms only a peripheral item in the diet of the Peregrine, the falcon plays a major role in Ring Ouzel predation.

Should the Peregrine maintain its current standing in the county or continue to increase, then the local Ring Ouzel population will probably persist at a low level, chiefly occupying sub-optimum breeding habitats which are unsuitable for the falcon. It is also possible that some Ring Ouzels will take refuge in the conifer plantations which adjoin several former sites, and where a very small number of pairs may already breed unnoticed. This is not unheard of in Britain, and is not an uncommon practice on high ground in continental Europe. A male bird seen carrying food into conifers during the 1995 survey, however, was the first indication on record that Ring Ouzels may breed inside conifer plantations in Glamorgan and possibly in Wales, though a male was seen holding territory on heather-covered scree in thicket-stage forest at Llanerchyrfa, Breconshire, in 1993 (M. Shrubb, *pers. comm.*).

The wider implications of the 1995 Glamorgan survey results are that, in Wales at

least, Ring Ouzel breeding population estimates based on data collected over the period from 1960 to 1985 are likely to be artificially high, as a result of unusually low levels of predation at that time, and could provide a poor indication of the breeding population in the mid 1990s.

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TAWNY OWLS *Strix aluco* BREEDING IN CLWYD FOREST DISTRICT

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SUMMARY

Tawny Owls breeding in Clocaenog Forest were studied from 1988 to 1995. Birds bred in nest boxes, over 50 of which were erected for Kestrel, Barn Owl and Tawny Owl in the forest area. Between 5 and 14 Tawny Owl nests were located annually and 71 were monitored during the period. Average clutch size was 2.28; 89.5% of eggs laid hatched, with an average hatched brood size of 2.04; 66.2% of eggs hatched fledged, with an average fledged brood size of 1.35. Clutch size showed no significant annual variation over the period but there were marked annual variations in the number of eggs hatching and of young fledging, perhaps linked to climatic conditions or the availability of food (which was not studied). The distribution of occupied nests is mapped for each year.

INTRODUCTION

From the current returns for the annual newsletter of the Wales Raptor Study Group, it is apparent that the Tawny Owl (*Strix aluco*) is not a well-studied species in the Principality, a view reinforced by the lack of contemporary data mentioned by Lovegrove *et al.* (1994). This ringing study, mainly within the boundaries of Clocaenog Forest, most of which is at over 300 metres in altitude, began modestly by visiting two old nestboxes in spring 1988. Subsequently, in excess of 50 boxes and plastic drums have been erected around the forest for the use of Kestrel (*Falco tinnunculus*), Barn Owl (*Tyto alb*a) and Tawny Owl with about the same number of boxes available each year. The relative positions of the boxes occupied each year are shown in the maps for the years 1989-1995. The northern part of Clocaenog Forest has been left free of boxes (mainly as a control area where Tawny Owls are not encouraged to discover whether Long-eared Owls (*Asio otus*) will be more successful there). Here, we wish to present some of the results of the studies of breeding Tawny Owls that have been gathered, initially as part of the BTO Owls Project, but when that ended this study carried on, using the BTO project's methodology and submitting all the main aspects of the records on Nest Record Cards to the British Trust for Ornithology (BTO).

METHODS

Each spring all the boxes and drums are checked. When 'boxes' (whether they be wooden boxes or plastic drums) with eggs are located, measurements of the eggs — the

length, breadth and weight of each egg — are taken. From this the egg density is calculated using a formula provided with the Owl Project information sheets, so that the expected hatching date can be determined. The formula is:

$$\text{Egg density} = \text{Weight} / (0.507 \times (\text{Breadth})^2 \times \text{Length})$$

the resultant density being checked on a graph (provided for Owl Project volunteers) of egg density against number of days to hatching. When the hatching date is reckoned, the nest is visited one week after hatching in order to trap the female. Having done so, measurements are taken from her, including head + bill, wing length and weight, and the chicks are similarly measured. When the project was running volunteers were encouraged to make extra visits to the nest to make more measurements to check on the growth rates of the chicks; we have made no special effort to do so, mainly because of lack of time. About 10 days after the female has been trapped the nestlings are ringed, and sometimes after the expected fledging date a check is made to see if all birds ringed left the nest. Over the years there are some females that have been trapped on more than one occasion and there has been one nestling retrapped as a breeding female. In total, 71 nest records are used for analysis in this report. Clutch size, brood size at hatching and the number of young which fledge have been examined in turn using a single factor Analysis of Variance to examine if there were any statistically significant differences between years. The data which have been analysed are shown in Table 2.

RESULTS

The number of nests recorded each year were:

1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*Total*
2	5	6	11	14	14	10	11	73

From these nests only relatively small clutch sizes have been found (in 1988 the nests were only found when there were young so these records have been excluded from further analysis) and from these clutches, smaller numbers of fledged young have been produced (see Tables 1 & 2).

Table 1. Clutch size and the number of young fledged in 71 nests of Tawny Owls in Clocaenog Forest during 1989-1995.

	Clutch size (no: of eggs)						*No: of young fledged*					
	1	*2*	*3*	*4*	*Mean*	*SD*	*0*	*1*	*2*	*3*	*Mean*	*SD*
Clutches	5	43	21	2	2.28	0.63						
Broods							11	28	28	4	1.35	0.81

Table 2. Mean clutch sizes, numbers of eggs hatched and of young fledged annually in Tawny Owl nests in Clocaenog Forest during 1989-1995.

Year	*Number of nests*	*Mean clutch size*	*Mean Number of eggs hatched*	*Mean number of of young fledged*
1989	5	2.80	2.60	2.00
1990	6	1.83	1.33	1.17
1991	11	2.27	2.27	1.55
1992	14	2.43	2.14	1.36
1993	14	2.50	2.50	1.71
1994	10	2.00	1.56	1.22
1995	11	2.09	1.73	0.73

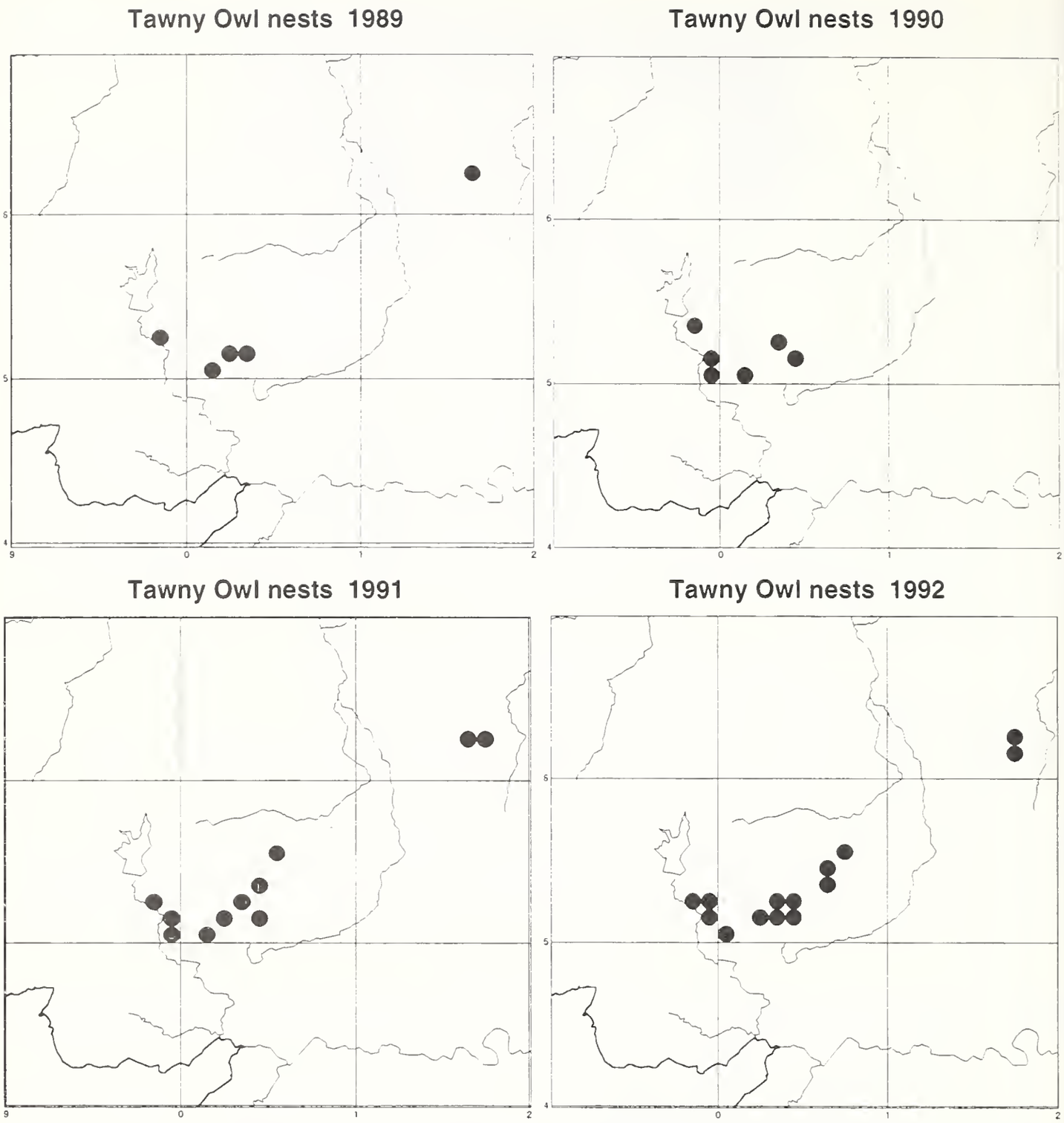

Figure 1. The distribution of known Tawny Owl nests in a square 30 km x 30 km in central Clwyd, mainly in Clocaenog Forest. Grid squares are 10-Km squares of the National Grid, the SW corner being SH94, showing also the Clwyd county boundary. The reservoir shown is Llyn Brenig.

Analyses of variance conducted on the data in Table 2 showed:

1. The difference in mean clutch size each year was not statistically significant ($F_{6,64} = 2.126$, $P = 0.062$).
2. The difference in the mean number of eggs hatched each year was statistically significant ($F_{6,64} = 3.221$, $P = 0.008$).
3. The difference in the mean number of young fledged each year was statistically significant ($F_{6,64} = 2.755$, $P = 0.019$).

It appears that the hatching success for 1994 and 1995 were much lower than in most of the preceding years and the fledging success in 1995 was extremely low. These poor results were probably related to adverse weather conditions during April and May in each of those

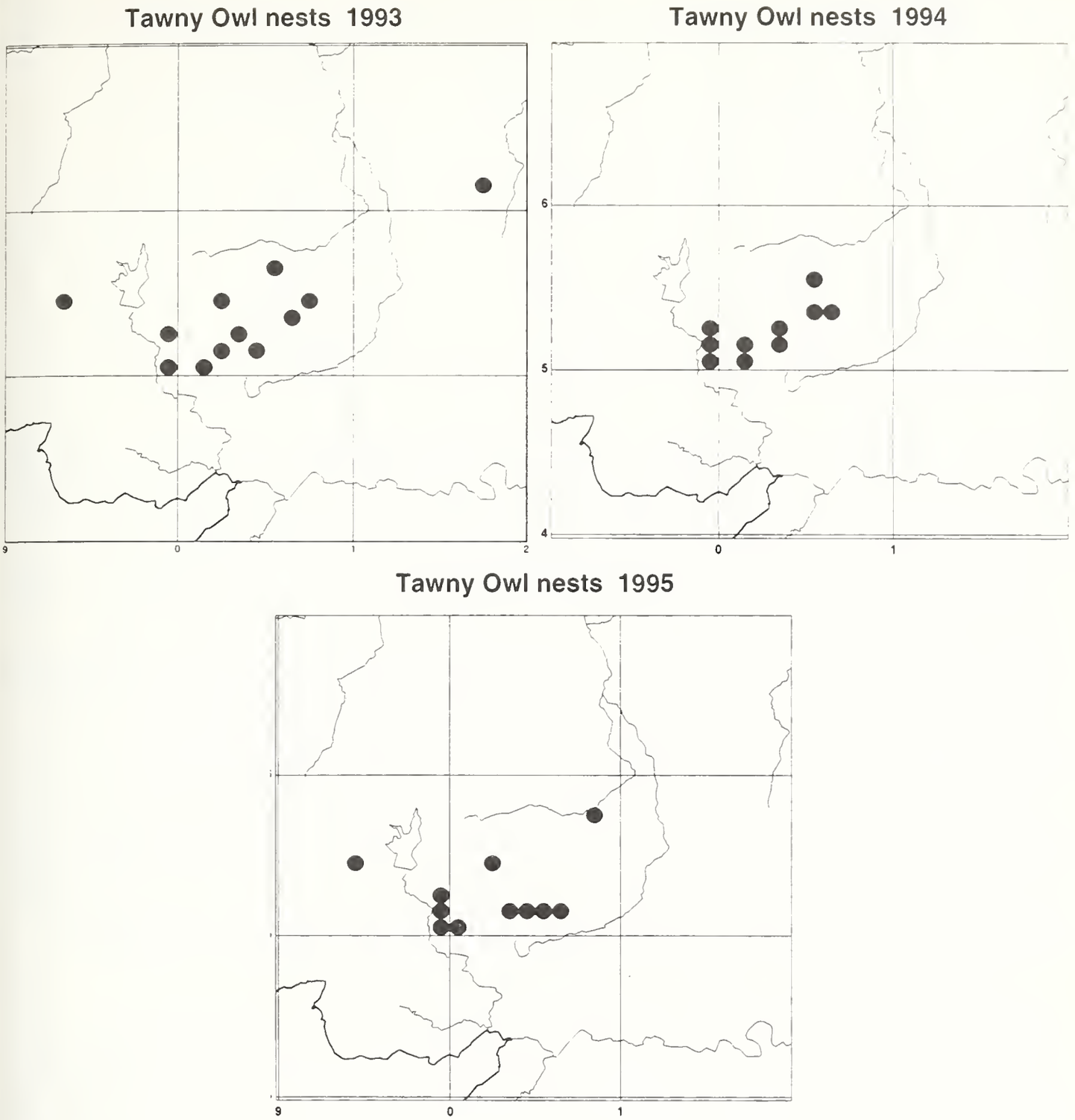

Figure 1. (Cont.): See Page 53.

years, though the numbers of voles in the forest area may also be implicated (we have no data about these). The data have been combined to provide overall breeding success figures for the study area (Table 3).

Table 3 shows that most losses in the breeding cycle of these Tawny Owls occurred after hatching (most, *i.e.* 89.51%, of the eggs actually hatched, but only 59.26% of the hatched eggs became fledged young) which suggests that there was a problem for the adults in finding sufficient food for the hatched young to fledge, or that there is some other factor which reduces the number of young, *e.g.* infection, predation, etc. The females were obviously fed sufficiently well for them to lay the clutches that they did, but when there were more mouths to feed there was a problem with keeping the young alive. We have found no evidence of predation at either the egg or young stage (of eggs, young or adults), but there has been evidence of siblicide or of the killing and feeding by an adult of a smaller

Table 3. Overall breeding success of Tawny Owls nesting in Clocaenog Forest during 1989-1995.

	Number of eggs laid	*Number of eggs hatched*	*Number of young fledged*
1989	14	13	10
1990	11	8	7
1991	25	25	17
1992	34	30	19
1993	35	35	24
1994	20	15	11
1995	23	19	8
Total	**162**	**145**	**96**
% of eggs laid	100.0	89.51	59.26
% of eggs hatched		100.0	66.21

sibling to a larger one. In the last year, a separate study of blood parasites (*Leucocytozoon* sp) by Dr. R. W. Ashford (Ashford, Spence and Lloyd, 1996) has shown that some young have very high levels of these parasites for at least part of the growing period which may prejudice the nestlings' overall health. We anticipate studying this aspect further.

Over the 7 years there have been totals of 32 adults and 101 nestlings ringed. Several females captured at the nest had already been ringed but, to date only one of these was originally ringed as a nestling (in 1989) and first caught breeding in 1993 (this does not necessarily mean that it takes 4 years to reach breeding age as she may have bred, unknown in earlier years) and again in 1995. Eight of the females have been trapped twice only, 3 have been trapped 3 times each (one having been first caught as a breeding female in 1989, missed in 1990, trapped in 1991, missed in 1992 and retrapped in 1993), one has been trapped 4 times and one has been trapped each year from 1991 to 1995, each breeding attempt being in the same box. The longest movements between retrapping sites have only been about 5 Km. The movements are illustrated in Figure 2 (of the area of Clocaenog Forest to the south east of Llyn Brenig) — some of the movements are of only a few hundred metres and some of the boxes have been used twice, or more, by the same female.

DISCUSSION

In this study there has been no known instance of breeding on the ground (see Avery and Leslie, 1990), and there has only been one instance of Tawny Owl using an old crow's nest (not included in this analysis because the outcome was unknown). However, the whole forest is not checked each year to discover if owls are using crows' nests or other sites on a regular basis. It is probable that there are many more nest sites available than we ever find numbers of breeding pairs. Figure 1 shows that the breeding attempts that we know of are not evenly distributed through the area of Clocaenog Forest and many boxes are unoccupied in each year, so it is unlikely that purely territorial factors are involved. One key aspect is that we have no record of the areas of standing forest and clear-felled areas in each of the years to which the nest-sites could be related. IWL has had to move a few boxes as the areas of forest they were in have been harvested, but there have always been other boxes within a relatively short distance to which the birds could move. Whatever the size of the Tawny Owl population (in terms of individuals alive) in Clocaenog Forest, the numbers of breeding birds are unlikely to be limited by the number of nest-boxes available for them. Lack (1966) states that in deciduous woodland in southern England, not all Tawny Owls breed in each year and that the proportion which do depends on the food supply, principally of small rodents. We have no data about the relationship between rodent densities and numbers of pairs found breeding or on the actual number of owls in the area. Do the nest-boxes increase

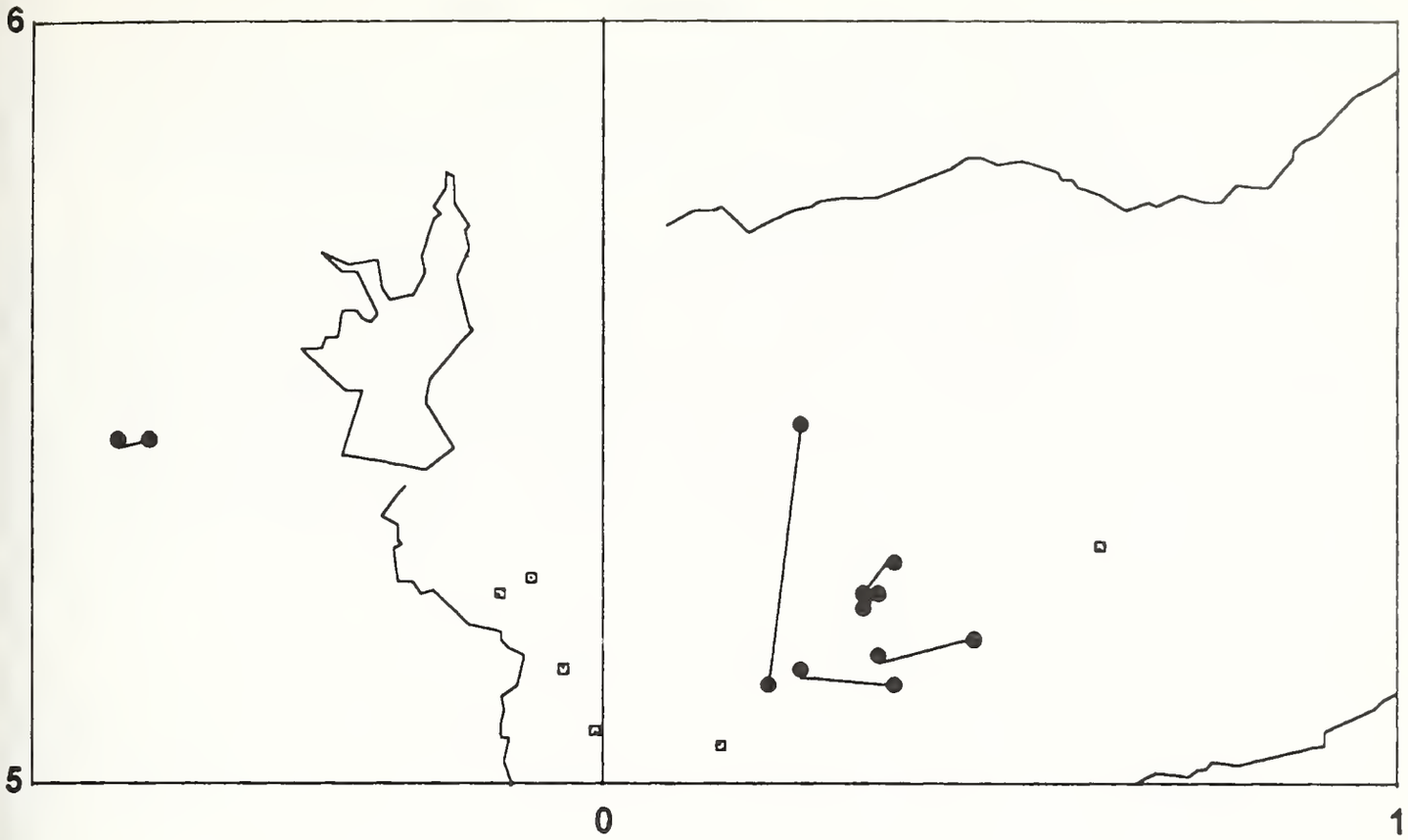

Figure 2. Movements of breeding female Tawny Owls in Clocaenog Forest. Filled circles indicate nest sites of females which moved between at least 2 breeding attempts, open squares nest sites where the female has bred at least twice without moving between years. Grid lines are of the National Grid, the complete 10-Km square shown being SJ05; Llyn Brenig is also shown.

the size of the population or do they just make some of the owls which are present easier to study?

Cramp (1985) gives a mean clutch size of 2.70 ± 0.81 eggs for Tawny Owls studied between 1949-72 in Britain, and Lack (1966) quoted a mean clutch size of 2.6 eggs in his study area near Oxford. Compared with this, our mean clutch size of 2.28 eggs, for the whole study period so far, seems to be quite acceptable. It is lower than the other published figures, but what is not clear is whether the difference relates to food supply or to the altitude of our nests. In terms of breeding success there seem to be some marked differences between what we have found and other published data — Cramp (1985) quotes that in Belgium about 24% of eggs do not hatch, and that in Britain, 44% of eggs do not hatch. We have found that only about 11% of eggs have not hatched. Also, Cramp (1985) states that only about 2% of hatched young fail before fledging, whereas our situation for this aspect is very much worse in that about 34% of our hatched young fail to fledge. The marked difference in the breeding success at the egg and chick stages between the owls studied by Southern, quoted in Cramp (1985), and our own results would be worthy of further study. We have found some evidence of brood reduction which is a well known breeding strategy in raptorial birds which may face uncertain food supplies. Breeding success in Tawny Owls has been found by Southern (see Lack 1966) to depend on (a) the density of the rodent prey, and (b) on the density of Tawny Owls. As discussed above, it seems unlikely in the Clwyd context (at least, within coniferous forest areas) that density of owls is a major determinant of breeding success (but that statement may be more guesswork and intuition than based on data). Taking these two factors (densities of rodents and owls) into account, Lack (1966) reported that breeding success in Wytham Wood varied between an output of 0.3-1.1 fledged young per pair. Despite the problems and poor breeding performance reported

above the output of fledged young in Clocaenog is still greater than that reported by Lack. Clearly, there is scope for more study to be done.

Cramp (1985) states that breeding adults are sedentary — our data do not contradict this. As yet we have not had a single recovery of one of our nestlings (other than the one trapped as a breeding female) but in Cramp (1985) it is stated that 83% of young Tawny Owls ringed in Britain move less than 10 km.

To date, all of our Tawny Owl studies have been in coniferous woodland, and it would be very useful to have a similar set of nest-boxes in deciduous woodland to enable comparisons between the different habitats. Currently, though, the Clocaenog Forest lacks areas of mainly deciduous trees, and the bulk of that extra study load could not be undertaken by either of us. This is an aspect that could possibly be undertaken in conjunction with University students. It would be helpful if more ringers were willing and able to study the breeding success of this interesting and relatively amenable species in Wales.

ACKNOWLEDGEMENTS

Hugh Claydon, Peter Hughes and Trefor Owen have been Forest Managers at different times in the course of this study; various people have helped with fieldwork in different ways; and we received helpful comments on an earlier version of this paper from Mike Shrubb and Iolo Williams. We thank all for their assistance. The maps were prepared, using DMAP, by Dr. A. J. Morton.

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LAPWING BREEDING AT WAUN-Y-POUND IN 1995

Following my paper on the Lapwing (*Vanellus vanellus*) colony breeding at the former opencast coal mine site at Waun-y-Pound, Ebbw Vale (*Welsh Birds* 1(1): 3-10), I continued observations in the area in 1995. The following is a summary of breeding results.

Altogether I found 86 nests there; 64 were on the former opencast site (25 in ungrazed fields and 39 in fields grazed by horses), 17 nearby on levelled factory plots beside the Heads of the Valleys road and 5 in an extension of Ebbw Vale cemetery. Some of these nests were repeats and I estimated the numbers of pairs as 55 on the opencast site, 5 in the cemetery and 15 on the factory sites. Even at the altitude of 350 m asl the first eggs were laid in the last week of March and the majority of birds had full clutches by Apr. 10th. Clutch sizes in the 86 nests were:

	Clutch size					
	c/4	*c/3*	*c/2*	*c/1*	*Mean*	*SD*
Number of clutches	69	12	2	3	3.71	0.68

The outcome was known for 73 clutches, of which 39 (53.4%) hatched at least one chick; these nests held 272 eggs, of which 151 (55.5%) hatched. Causes of failure were not determined in most nests, the eggs disappeared and no shell remains were found, but 8 clutches were taken by corvids and horses trampled one.

Chick survival was difficult to determine. In the only brood followed through to fledging, 3 out 4 young fledged. Chicks which were ringed away from nests ranged in age from one week to about 30 days (estimated by chick weight). The even distribution in the range of ages of chicks caught at random in this way possibly suggests that chick survival was quite high. However 6 dead chicks were found, all less than a week old, which possibly died of starvation. Ten adults were picked up dead during the season; 2 were killed on the roads and 8 by Peregrines (*Falco peregrinus*).

Andrew Dixon

GOSHAWK TAKING KINGFISHER

At about 11.00 hours on Oct. 10th 1995 I was sitting in the Centenary Hide overlooking the lagoon at Lake Vyrnwy RSPB reserve, when I heard and saw a Kingfisher (*Alcedo atthis*), which landed on a branch in front of the hide. After a few seconds it left its perch to cross the lagoon to another branch. Halfway across the water it was taken by a male Goshawk (*Accipter gentilis*). The Goshawk then sat for a short time at the edge of the lagoon actually holding the Kingfisher in the water, before flying off into a stand of pines.

Julia Sheehan

GOSHAWK TRYING TO TAKE MALLARD

On Dec. 23rd 1992, whilst counting wildfowl at the Usk Reservoir, Brecon/Carmarthen, my wife and I noticed an immature Goshawk, from its size a female, sitting quietly in a conifer overlooking the water. Below it a party of Mallard (*Anas platrhyrhnchos*) were swimming among some flooded sallow bushes. After about 5 minutes

the Goshawk dropped off its perch, swooped round a bush and tried to take a duck off the water, which half-dived to evade it. It missed and returned to its perch. We were struck by how little notice the rest of the ducks took of this incident, doing little more than swimming out to deeper water and then returning. The Goshawk stayed on its perch for another 15 minutes but then departed without trying again.

M. Shrubb

GOSHAWK TAKING BLACKCOCK AT LEK

In 1988, whilst watching Blackcock (*Tetrao tetrix*) near Bala, north Wales, during research for the RSPB, I observed a female Goshawk to take male Blackcocks at lek twice in the space of 3 months. As both incidents were at the same lek, I assume the same female was involved each time. It is probably not a coincidence that, whilst this lek held 4 male Blackcock during 1986-88, from 1989 to the present there has been none. It is worth noting that the range of weights for nominate male Blackcock shown by *Birds of the Western Palaearctic* is 1000-1750g. that for nominate female Goshawk is 820-2054g, a good indication of the power of this raptor.

I. T. Williams

These 3 incidents give an interesting insight into the range of species that may be taken by Goshawks. Published lists of prey in Britain suggest that Kingfisher is a very unusual item for any raptor to take. *Ed.*

METHODS USED BY MAGPIES TO PREDATE HOUSE MARTIN NESTS

In 1990 an old nest in the small colony of House Martins (*Delichon urbica*) on our house at Llanasa was occupied by House Sparrows (*Passer domesticus*), which had young in the nest on May 21st. On that day I watched a Magpie (*Pica pica*) flying repeatedly at this nest and hitting it until it knocked it off the wall, whereon it ate the nestlings. Subsequently House Martins rebuilt the nest and reared young successfully. In 1995 a nest of young House Martins in the same spot suffered a similar fate, the Magpies perching on the handrail of some steps up to our house just below it and flying up to hit the nest. As this is the only nest in the colony Magpies have predated in this way, it seems likely that it is the presence of a convenient perch from which to launch attacks which encourages them. I intend placing an artificial House Martin nest here for the future in the hope of discouraging this ploy.

Louise Jones

MANX SHEARWATERS CALLING AT SEA

The *Birds of the Western Palaearctic* (vol. 1) regards the Manx Shearwater (*Puffinus puffinus*) as being silent at sea but draws attention to the record in the *Handbook* of calling from 'a big concourse on the water at midday' observed by C. Oldham. It seems worth putting on record, therefore, the fact that they sometimes call sporadically when rafting on the sea in the evenings near their breeding colonies on the Pembrokeshire islands.

They also gather in rafts of the sea at their feeding grounds during fog or heavy drizzle, when they call in a sustained manner. This calling attracts individual birds which were presumably flying nearby but out of sight of the raft. Thus its function may be to provide a 'beacon' for gathering birds together.

G. H. Rees

REVIEWS

BIRDS OF GLAMORGAN

CLIVE HURFORD & PETER LANSDOWN

Published by the Authors and obtainable from Department of Zoology, National Museum of Wales, Cathays Park, Cardiff, and leading booksellers. Price £25.

This is a handsome hard-backed book of 225 pages with a superb colour photograph of Ravens at a nest on the cover. It provides a detailed account of all bird species recorded within the old Watsonian vice-county of Glamorgan. The systematic list includes and updates all records up to 1992 of all 115 regularly occurring breeding species, occasional breeders, winter visitors, passage migrants and vagrants — in all some 300 species. There is an appendix of further species for which records have been excluded from the systematic list for a variety of reasons from birds being of likely captive origin (for example Mandarin and Red-crested Pochard) to where their identification is uncertain or not fully established.

Glamorgan is by far the best documented vice-county in Wales. John Lucas, I learnt, produced the first checklist of the birds of Glamorgan in 1802, but it was in 1900 that the Cardiff Naturalists' Society published the first book of the 'Birds of Glamorgan'. A second followed in 1928 and a third, edited by Geoffrey Ingram and Colonel Morrey Salmon, in 1936. In 1967 to celebrate the centenary of the Society, the fourth 'Birds of Glamorgan' was published, with a supplement to this in 1974 and a breeding bird atlas edited by Steve Young in 1975.

Clive Hurford and Peter Landsdown are to be congratulated on this new publication; they have done a marvellous job in researching the literature and many thousands of records to update previous books on the birds of Glamorgan. Whilst they have written much of the text, the book is really a team effort with many other people contributing chapters, photographs or sketches or helping with the fieldwork which enabled the breeding bird distribution to be mapped.

Chapters cover geology, bird-ringing, the history of bird recording in Glamorgan and bird habitats as well as the systematic list which is the 'meat of the book'. I found the text on bird habitats particularly useful; this is well-illustrated with both black and white and colour photographs, including those of familiar and important sites such as Crymlyn Bog and Kenfig.

Incorporated in the systematic list are maps of breeding distribution; these combine those from Derek Thomas' West Glamorgan Atlas with the maps from the surveys in mid and south Glamorgan coordinated by Ken Lloyd who sadly died before he could see the results of his hard work. The detailed species accounts are full of interesting snippets. They document the changing fortunes of many species — the declines and losses of species such as Lapwing, Redshank, Yellow Wagtail, Woodlark and Nightingale, as well as the increases of, and colonisation of the county by, others. It is sobering to read that from a common bird in the late 1980s the Yellow Wagtail has declined to such an extent that since 1986 there have been just two records of breeding pairs, in 1992. By contrast Dippers and Kingfishers which declined between the 1920s and 1960s because of river pollution and disturbance in the southern third of the county, have increased again and are now well distributed on the coalfield rivers. Species such as Bearded Tit have come and gone; Chough returned in 1990 and bred the following year having last bred on Gower in 1895. Peregrine too which were lost as breeding birds in 1961, returned again in 1977 since when their population had increased to 21 pairs by 1991. Siskin are new breeding birds, whilst Redpoll, Crossbills, Raven and Pied Flycatcher have all increased in numbers, the planting of conifers having aided at least three of these.

One minor criticism I have relates to the format of the book. The text is crammed onto the pages with the narrowest of margins. Despite this, I have no hesitation in strongly recommending the book as a 'must' to anyone with even a passing interest in Welsh ornithology. Glamorgan may be the most highly industrialised of Welsh vice-counties but it still has much to offer the bird-watcher as well as the botanist or entomologist.

Stephanie J. Tyler

WELSH BIRDS

'Welsh Birds' is the journal of the Welsh Ornithological Society and is published twice annually, in June and December. The December issue is primarily devoted to the Welsh Bird Report and the annual Report on Bird Ringing in Wales.

Papers for Welsh Birds are welcomed by the Editor on any aspect of Welsh Ornithology. The Society is anxious that the journal should accurately reflect present ornithological activity in Wales. Thus we hope that all workers, professional or amateur, with results of bird studies in Wales, will always consider publishing information about these here. All papers will be reviewed by the Editor and an independent referee. Authors should follow the format of papers published in the journal and guidelines for authors have been drawn up and are available from the Editor (address inside front cover). Papers are accepted and published in either Welsh or English. Papers in Welsh should be supplied with captions to tables and figures in both Welsh and English and with an English summary. This follows standard international practice.

Short notes on interesting or unusual features of behaviour recorded in Wales are also welcome. An accumulation of such items is of considerable value. Notes should be short and succinct, ideally of not more than half a page in length. Notes may also be submitted in either Welsh or English.

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